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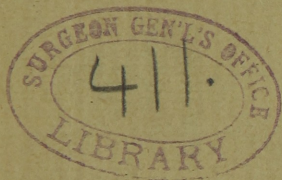
Cephalæmatoma Verum  
Externum.

BY

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BALTIMORE.



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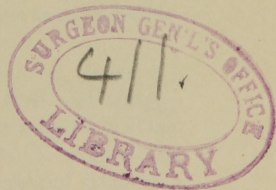
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*Vides ut amplissima eademque propemodum intentata pateat via ad recens natorum morbos attenta dum vivunt observatione, accurata autem post mortem dissectione pervestigandos.*

MORGAGNI, *de sedibus et causis morborum.*



# CEPHALÆMATOMA VERUM EXTERNUM.

## SUBPERICRANIAL BLOOD-TUMOR OF THE NEWBORN.

BY HOWARD A. KELLY, M.D.,

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### I. INTRODUCTORY.

### II. DESCRIPTION OF THE DISEASE.

*A. Clinically; B. Pathologically; C. Diagnostically; D.  
Treatment.*

### III. HISTORY.

*a. From the sixth century down to the present, the period of confused observations; b. From Michaelis's paper (1799) down to Valleix's (1838), covering the period of general recognition of the disease; the multiplication of clinical observations and active discussion of its pathology, down to the settlement of the most important questions; c. From Valleix's writings to the time of Virchow (1863), since which time no important facts have been adduced.*

### IV. ANALYTICAL CONSIDERATION.

*a. Name; b. Sex of child; c. Number; d. Situation; e. Primiparæ; f. Pulsation; g. Size and shape; h. Fluctuation; i. Color; j. Sensitiveness; k. Bony ring; l. Date of appearance; m. Frequency; n. Pathology; o. Etiology; p. Differential diagnosis q. Treatment.*

### V. MEDICO-LEGAL IMPORTANCE.

### VI. ADDITIONAL CASES.

### VII. CONCLUSIONS.

### VIII. BIBLIOGRAPHY.

## I. INTRODUCTORY.

IT affords me a peculiar pleasure to bring before this Society a full consideration of one of the most important diseases of early childhood, awarding to it more attention than it has yet received at the hands of any writer in the English language. As an American I am not, therefore, open to the imputation of an eminent writer in Austria, as long ago as 1846, when he designated cephalæmatoma as "a disease about which far too much has been written,"<sup>1</sup> while a German writer, in 1854, spoke of "the unseemingly inflated literature upon this subject."<sup>2</sup> Not only has no full account of cephalæmatoma yet appeared in the English language, but I am not aware that any English writer has ever added a single fact in the evolution of our knowledge of this disease.

Any disease may well be considered important as well as interesting when it affects about one in every two hundred and fifty children, occasioning a conspicuous deformity upon the sinciput, possessing marked specific characters, and running a definite course toward recovery; tending, however, in rare instances to undergo serious retrograde changes which may even threaten the life of the child.

Although the prevailing ignorance of the medical profession as to the existence of cephalæmatoma is a sufficient stimulus for a writer, the subject possesses an additional charm for the specialist, lending an impetus to his work in the references which are to be found by careful reading between the lines of almost every prominent gynecological writer, from the earliest down to the present century. In

<sup>1</sup> C. Rokitsansky, *Man. of Pathol. Anat.*, translated by C. H. Moore, Phila., Blanchard & Lea, 1855, vol. iii. p. 172.

<sup>2</sup> Dr. V. Bruns, *Die Chirurg. Krankh. und Verletzungen des Gehirns & Seiner Umhüllungen*, Tübingen, 1854.



this way a study of the history of cephalæmatoma affords a conspectus of the natural history of gynecology.<sup>1</sup>

I know of no other disease, with the single exception of extra-uterine pregnancy, which is thus rendered more attractive to the scientific specialist.

## II. DESCRIPTION OF THE DISEASE.

### A. CLINICAL HISTORY.

Cephalæmatoma is peculiarly a disease of the newborn child. It consists in the formation of a circumscribed effusion of blood between the pericranium (periosteum) and one of the flat bones underlying the hairy scalp.

On the second or third day following birth an elevation or bump is noticed on the side of the head, over one or the other parietal bone, usually near the posterior superior angle of the right. This swelling never crosses a suture, and gives the head a peculiar lopsided appearance, which increases as the tumor, at first covering a small area, gradually extends its limits on all sides, becoming in a few days prominent and tense, elevated from a half an inch to an inch from the skull. The cyst thus formed is fluctuating; the color of the overlying skin, which can be pushed about on the immovable tumor, remains unchanged; pulsation is absent; pressure occasions no pain, and if increased does not diminish the size of the tumor or provoke any signs of compression of the brain.<sup>2</sup>

<sup>1</sup> "Il Importe Beaucoup de Connôître l'Histoire de la Science à laquelle on s'attache." Boerhaave.

<sup>2</sup> J. B. Paletta, "De Abscessu Capitis Sanguineo Recens Natorum." *Exercitationes Pathologicæ*. Mediolani, 1820, p. 123, gives this classical description of the disease (the book was published in his seventy-third year):

"Infantes nonnulli recens in lucem editi ab alterutro capitis latere abscessu quodam afficiuntur, scilicet tumore molli cum aliquo fluctuationis sensu, non

A day or two after the tumor is first observed a well-defined bony ring can be felt surrounding its margin, conveying at first touch the impression that the bone is wanting within. If the tumor is not too tense, its bony floor can be felt upon deep pressure. In from ten days to two weeks the lump thus formed begins to diminish in size from absorption of its contents. As it becomes flatter it often has a peculiar parchment feeling, and small bony plates can frequently be felt projecting into its membranous covering.

When all of the fluid has been absorbed the upper layer of the tumor comes in contact with the skull bone, and every trace of the deformity wholly disappears. In some rare instances, the contents of the sac suppurate and produce necrosis of the underlying parietal bone with perforation of the skull, or softening and perforation may take place externally.<sup>1</sup>

The natural tendency of the disease is toward a spontaneous cure.

dolenti, cutis colore non mutato, capiliamento integro, sanguinem fluidum intus continente.

"Tumor hic pleurumque sincipiti dextero incumbit, qui alias ovi maximi, interdum duorum ovorum magnitudine, parum elevatus fere transverse positus, interdum sed rarius secundum sincipitis longitudinem protenditur, adoritur autem infantes, quantum ego observavi, celeri lucina susceptos, tumque a parvulo incrementa capiens abscessus ad treslato digitos in longitudinem intra hebdomadam excrecit. Illi vero, qui difficili partu excluduntur, perraro hujus generis abscessu tenentur, et tumor, qui inde fit, dum adest paragonomphosis, non ejisdem est indoles. . . .

"Compresso circum tumore, digitisque basim ejus contrectando deprehenditur circulus osseus aream tumoris veluti circumvallans, qui ut ora inæquali, et nonnihil extenuata eminet, sic facit ut in ea area quidquam ex ossis substantia deperditum esse existimes."

<sup>1</sup> C. Zeller, "De Cephalæmatomate seu Sanguineo Cranii Tumore Recens Natorum Commentatio Inauguralis," Præs. Franc. Carol. Nægelo, Heidelbergæ, 1822, thus describes the disease, p. 1, "Tumores infantum recens natorum cranio et quidem forsitan semper alterutri aut utrique ossi parietali insidentes, indolentes, circumscriptos, cuti concolores, molles, elasticos, magis minusvi tensos, pressione fluctuantes, ex sanguine inter pericranium craniumque ipsum collecto ortos," and pages 2 and 3, "Persæpe in tumoris ambitu margo seu circulus aliquantum prominens tactu dignoscitur, quo facile inducimur, ut intra hunc marginem materiam osseam deesse, vel os foramine pervium esse credamus."



## B. PATHOLOGY.

The morbid process consists in the separation of the pericranium (periosteum) from the parietal bone by a slow hemorrhage from the periosteal vessels, at first in the form of a thin layer, increasing and becoming more elevated, the contained blood being bright red if observed in the early stages of the disease, and dark but still fluid in its later stages.

Upon dissection the overlying tissues are found unchanged in appearance, or, at the utmost, a few ecchymotic spots with some discoloration are found in the *galea aponeurotica*. The pericranium when thus bared appears dark from the fluid blood beneath it. If examined at an early date it is found actually unchanged, excepting in its topographical and physiological relation to the bone which underlies the affected area. After a few days a delicate villous layer, which sometimes looks shaggy and red like the lining of an old fistulous tract, is deposited from the contained blood over the inner surface of the pericranium and the bone—just as in the case of hæmatomata in other parts of the body.

In spite of its separation and the underlying fluid blood, the pericranium continues actively to generate bone tissue, in the same manner it would have done had it retained its connection with the parietal bone. It soon becomes studded all over on its under surface with little Wormian islets, developing from the periphery, more rapidly above, and growing toward the centre.

*Pari passu* with this formation of bone is usually noted the absorption of the fluid, so that by the time this periosteal bone-metamorphosis has constructed a complete shell the upper more, and the lower less, convex wall of the cyst fall so exactly together that the defect is filled in, and no deformity whatever is observable. The absorption at times, however,

proceeds so slowly that a thick bony shell coats the still elevated pericranium, resulting in the formation of a hard boss on the head.

Around about the margin of the tumor, at the point where the detached pericranium meets the bone, after the tumor is a few days old, the bony ring already spoken of can be found; this on section is found to be a triangular bony ridge one or two millimetres in height. The pericranium is tightly attached to its sloping upper surface, its under surface rests on the parietal bone. Its inner surface perpendicular to the bone remains free, exposed to the fluid blood forming the cyst. The minute anatomy of this ridge is a delicate fibrillar network enclosing numerous sand-like bony particles. The parietal bone itself is simply stripped of its periosteum, and is in the early stages of the affection in no way diseased. It never becomes carious except as a consequence of suppuration of the cyst.

### C. DIFFERENTIAL DIAGNOSIS.

Diagnosis properly includes all the differential points separating this from every other form of tumor found upon the infant's head; the diseases, however, which are most liable to be mistaken for cephalæmatoma are *caput succedaneum* and *hernia cerebri*.

#### *Caput Succedaneum.*

The point of similarity between caput succedaneum and cephalæmatoma lies in the fact that both are swellings upon the head of the newborn child; but while caput succedaneum always arises during the birth, being born with the child, appearing upon the part of the head presenting during labor in the pelvic excavation, following difficult labors, the reverse is the case in cephalæmatoma, where the tumor usually forms after the birth (frequently an easy labor), its



preferable site being upon that parietal bone which was not most prominent during labor, usually upon the right.

While the tumor of a caput succedaneum has an ill-defined border, crosses sutures, is discolored and doughy, and disappears rapidly after labor, the tumor of a cephalæmatoma increases in size after it is first observed, has sharply-defined borders, and the overlying skin is unchanged in appearance.

Further, the most marked characteristics of the cephalæmatoma—the sharp outline, the bony border, the absence of discoloration of the skin—are never observed in the caput succedaneum. The bony ring is imitated by no other form of tumor of the head. (*One exception noted below.*)

#### *Hernia Cerebri and Cephalæmatoma.*

Hernia cerebri appears preferably in the occipital region where cephalæmatoma is but rarely found, and while the cephalæmatoma is lateral and situated upon the bone itself, the hernia appears in the line of the sutures, where cephalæmatoma is never found. Pressure upon the hernia produces uneasiness, twitching, and even convulsions, while the cephalæmatoma can be pressed upon with impunity.

*Anastomotic Aneurism* forms a tumor of a dark color with an irregular surface, and presents neither the appearance nor the history of the cephalæmatoma.

#### D. TREATMENT.

The best plan in most cases is to avoid interference, and preserve an attitude of expectancy. The utmost that is allowable is the use of cooling dilute spirituous or acetous lotions. It is only necessary to recall the anatomical relations of the mass of blood thus placed, to realize how little palliative measures are likely to promote absorption. Smaller tumors thus let alone are absorbed in about three weeks, leaving no

trace behind, and the rule is for larger tumors also to disappear upon patient waiting.

When signs of suppuration set in, as evinced by heat, tenderness, and redness, together with constitutional disturbance, no time should be lost in making a free incision, beginning at the part of the tumor most dependent, as the child lies; the sac should then be washed out and drained. Healing, even after suppuration, may be very rapid.

If the tumor shows no inclination to diminish in size after two or three weeks, it may then be carefully washed, the hair shaved off over a small area rendered aseptic, and opened with a bistoury or punctured with the larger trocar of an aspirating apparatus.

After thus evacuating all the fluid, a compress of dry absorbent lint is applied and kept in place by a cap, thus keeping the pericranium in close contact with the bone.

The writers early in this century and even in the last, almost without exception, advocated a free incision of the tumor, and they speak with surprising frequency of a union by first intention. Union by first intention ought therefore at least to be the rule to-day in all non-suppurative cases in which it is necessary to interfere surgically.

### III. HISTORY.

The history of cephalæmatoma is deeply interesting, beginning at a remote period, when the first reference to it is found in the sixth century, in the writings of Aëtius, of Amida, in Mesopotamia, a graduate of the medical school of Alexandria, who practised in Byzantium. He speaks in his sixth book "Of a collection of fluid in the skin without the pericranial membrane, or between the pericranium and the bone; a tumor forms at that part of the head where the collection has taken place, which is of uniform color, painless and soft,



yielding and changing on pressure with the fingers. If the tumor arise spontaneously it is unchanged in color and painless, but if it arise from a blow or bruise it is red from the start and painful. Later, however, it changes in form to a thin nature, it is of uniform color with the skin and painless.”<sup>1</sup>

It is clear from this quotation that Aëtius is speaking of fluid tumors of the scalp, and distinguishes between bumps and bruises, and such spontaneous tumors as cephalæmatomata. The want of the perfect clearness in the description is due in the first place to the fact that the differential signs of cephalæmatomata were not well known until the present century, and in the second place to the want of specific accuracy of description which, as a rule, characterized all the ancient writing throughout.

A long interval of more than a thousand years separates Aëtius from the next writer.<sup>2</sup> In 1682 Cornelis Stalpart van der Wiel, of Haag, Holland, published a book of remarkable observations in which he clearly refers to cephalæmatoma. We must, before reading his note, recall the fact that in his day “hydrocephalus” was a generic term applied to all fluid accumulations about the head, within and without.

He says “that hydrocephalus of this sort arises from violence and other external cause, and it contains, too, a

<sup>1</sup> Aëtius Amidenus, *Librorum Medicinalium* Lib. vi. init. T. I. fol. 99, vers. ed. Venet. 1534.

“ἀγροῦ μὲν οὖν ὑγροῦ συλλεγομένου κατὰ το δέρμα, ἐξωθεν τοῦ περικρανίου ὑμένο· ἢ μεταξὺ τοῦ περικρανίου καὶ τοῦ ὀστέου· ὄγκος συνεδρείνει κατὰ τι μέρος τῆς κεφαλῆς· καθ’ ὃν ἡ γεγονῖα συλλογὴ· ὁμόχρους ἀναλγής· εὐαφής· εἰκοντος καὶ μεθισταμένου κατὰ τὴν τῶν δακτύλων ἐπαφὴν· καὶ εἰ μὲν ἀντόματος γένηται ἐξαρχῆς, ἀνώδυνος καὶ ὁμόχρους ἐστὶ ὁ τόπος· εἰ δὲ ἐκ πληγῆς ἢ θλάσματος, κατ’ ἀρχὰς μὲν ἐνερευθὴς καὶ ἐπώδυνος γίνεται ὁ ὄγκος· ὕστερον δὲ ἀργενομένου τοῦ ὑγροῦ καὶ μεταβαλλομένου εἰς λεπτὴν οὐσίαν, τότε ὁ ὄγκος ὁμόχρους καὶ ἀνώδυνος.”

<sup>2</sup> Haller (Dorpat, 1824) says of Aëtius in this connection: *Ex loco quodam scriptorum (Aëtii) suspicari licet, et hujus animo observatam fuisse hujus morbi memoriam, tametsi manca enumeret istius phenomena, ab alius capitis tumoribus non satis distincta.*”

muddy, bloody, or grumous fluid, while that in the internal hydrocephalus is clear and limpid.”<sup>1</sup>

In 1682, the same year in which Stalpart van der Wiel wrote, the great obstetrician Mauriceau<sup>2</sup> published the first edition of his work, and in the twenty-fourth chapter of the third book, on the injuries of the head and other parts of the body of the newborn child (*Des contusions et meurtrissures de la teste et des autres parties du corps de l'enfant nouveau-né*) he remarks, immediately after an excellent account of *caput succedaneum*, “Sometimes the swelling does not go down immediately, because the extravasated blood by its long delay in one part has lost its life and become deprived of its gases, and is unable to move. In this condition, either resolution must take place, or, if there is much delay, suppuration will occur. Hot fomentations with wine are the best means of securing resolution. If, in spite of the treatment, suppuration comes on, one will not delay too long, on account of the danger of caries of the delicate cranial bones, but will open with a lancet, *sec. art.*”

A phenomenally clear description appears in the following year, 1683, by M. B. Valentinus, of Giessen, in the *Ephemerides*,<sup>3</sup> where he describes the case of an infant seven days old which had a tumor on the left parietal bone, which had been observed from its birth. The tumor was as large as a goose-egg, painless and fluctuating, and when opened a large amount of blood escaped. The child was thus cured. (v. Zeller, p. 50.)

In the year 1712, Max Preuss wrote an account of swellings on the head of newborn children, also in the *Ephem-*

<sup>1</sup> “Quod tales hydrocephali non tantum a violentia, aliave causa externa, nascantur, sed et quod in iisdem limosa quædam, vel sanguinolenta, turbulentaque, semper reperiatur lympa, cum tamen in internis hydrocephalis ea clara semper et limpida appareat.” (Van Sweiten Comment., iv. page 119.)

<sup>2</sup> *Traité des Maladies des femmes grosses et de celles qui sont nouvellement accouchées*, Paris, 1682, p. 393.

<sup>3</sup> *Ephem. Nat. Cur.*, Dec. 11, An. ii. Obs. 162.



*erides*,<sup>1</sup> where he attributes tumors of the head of newborn children to violence done the scalp in difficult labors, or traction efforts of the midwife dragging the scalp loose from the cranium, by means of which the blood is prevented from returning, ruptures its vessels and forms little varicose soft sacs full of blood, sometimes containing corruption and ichorous matter.

The activity of the scientific medical men of the eighteenth century was very great, and they have left us numerous other important references of which the next appears in 1722, in the work of Th. Zwinger,<sup>2</sup> of Basel, where he thus records a case, stating that twenty years ago he was called to see a little boy, recently born, who had a soft, indolent serous tumor, of uniform color with the skin, on the top of his head, of the size of a goose-egg. The child was perfectly healthy. Consultation was held and determined that the tumor was full of fluid between the membranes of the brain and the cranium. They deliberated carefully whether to open and let out the serum. They determined to wait a little, and purged the child and used fomentations. One surgeon wished to open the tumor, letting out the fluid, but another recalled several cases of death from this procedure; later two surgeons wished to puncture the tumor, thus getting rid of the danger of gangrene and slough, but the physicians with another surgeon opposed themselves to this plan. The tumor was then treated with a decoction of herbs

<sup>1</sup> D. Max Preuss, *Infantum recens natorum tumores in capite lati et elati, sanguineo-varicosa, et ichorosi interdum*, Vratislavia, 1712. Acad. Cæs.-Leop. Carolinæ naturæ curiosorum *Ephemerides*, Cent. III. Obs. xx. p. 42.

<sup>2</sup> *Pædojatreja practica*, Basileæ, p. 29, "Tumor mollis verticis capitis infantibus recens natis." "Viginti plus minus anni præterlabuntur, quibus, vocatus ad filiolum recens natum capitanei ejusdam Basiliensis, consilium inire rogabar cum chirurgo alias satis experto, ad tumorem mollem, indolentem plane serosum, cuti concolorem, quem iste in bregmate habuit magnitudine ovum anserinum plane æquantem, alias vegetus, vivax atque labe ulteriore omni immunis." "Tandem vero in hoc convenerunt, tumori huic neque emplastrum, neque cataplasma, neque corrosivum qualecunque esse applicandum, sed herbas, etc." "Tumor sensim immunitus et tandem plane dissipatus fuit."

in wine, and finally disappeared as the writer naïvely observes: "Atque ita puellus feliciter à tumore liberatus in hunc usque diem anni 1720, sanus et incolumis vivit." Later, at the end of the chapter, Zwinger cites a case in which a surgeon opened a tumor and the child died in thirty hours in convulsions, and another case in which a barber treated a tumor with a plaster and the tumor suppurated and the child died.

Not ten years more passed by before a curious, careful study of the disease appeared in 1731, at Paris, at the hands of F. Le Dran,<sup>1</sup> who saw in these tumors of the head a specific disease, and, going further than his predecessors, discovered the little bony ring surrounding the tumor; but his additional observation misled him in his inference as to its nature, as he at once took the tumors to be cases of *hernia cerebri*, an error into which he led many of his followers.

With some circumstantiality he writes: "In the beginning of September, 1728, Mademoiselle Neveu, living in the Princess Street, sent me her child which she had borne two days previously. At the time of its birth they had discovered a swelling occupying almost the entire right parietal bone, soft and indolent, an inch in height and fluctuating. I hesitated, at first, to express an opinion, as I felt at its circumference a bony ridge which gave me the impression that the ossification of the cranium was wanting in that place, and so I questioned whether the tumor was not a *hernia* of the brain, or if it was an aneurism formed by the rupture of a little artery. Convinced that the tumor in question was a *hernia* of the brain, I put on thick compresses soaked with brandy.

"At the end of a month the tumor had entirely disappeared." He frankly says at the close,<sup>2</sup> "Although I have considered and treated this disease as a *hernia* of the brain, I leave it to the reader to decide as to its nature."

<sup>1</sup> Obs. de Chirurgie, T. i. Obs. 1, Paris, 1731.

<sup>2</sup> Quoique j'aye regardé et traité cette maladie comme une Hernie du Cerveau, je laisse au lecteur à décider de sa nature."



Still more distinct becomes the clinical picture which we find in the *Commerc. Lit. Phys. Tech. Med. Norimbergæ*, for 1734, p. 31, in a reference to a case in which there were two tumors. "Later two globular eminences or tumors arose; the left the size of the fist and the right the size of a hen's egg, both soft to the touch."<sup>1</sup>

In 1738 appeared a carefully-written article by D. D. Trew, in which he accurately describes the disease, but with undue deference to an opinion, adopted Le Drau's idea that it was a hernia cerebri. Trew<sup>2</sup> remarked the characteristic lateral site of the tumors, and the fact that they appear at birth or soon after, and that the sensation conveyed upon palpation is, that there is a hole in the parietal bone. Both tumors disappeared under emollient applications; and, as he puts it, the bones gradually drew together.

In 1749 Corvinus<sup>3</sup> wrote an essay on hernia of the brain, in which he clearly referred to this affection. He says: "On the right parietal bone, beneath the pericranium, was a bloody tumor containing abundant extravasated blood, filling the pericranium, detached and protruding from the parietal."<sup>4</sup>

Inasmuch as there has been a tendency on the part of writers since 1800 to neglect the work of the last century, and date the discovery of the disease from a paper written by Dr. Michaelis, of Harburg, in *Löder's Journal*, in 1799, it becomes deeply interesting to note as we advance the frequent unmistakable references made by our predecessors of more than a hundred years, whose acute observation was often drawn to a complaint occurring with such frequency and presenting such a startling appearance. Their struggles to estab-

<sup>1</sup> "Posterior duo globi, seu tumores, exstant; sinister pugni magnitudinem, dexter ovum gallinaceum æquans, amboque molles ad tactum erant."

<sup>2</sup> *Commerc. Lit. Phys. Tech. Med. Noric.*, 1738, p. 412, Ex Communicatione, D. D. Trew.

<sup>3</sup> *De Hernia Cerebri*, Argent, 1749.

<sup>4</sup> Ad os parietale dextrum sub pericranio obtulit sese tumor sanguinolentus satis copioso sanguine extravasato, pericranium a dicto osse penitus separamente atque protrudente repletus." He cites a case where hernia cerebri was complicated by cephalæmatoma,

lish the etiology, diagnosis, and pathology are particularly interesting to one reading between the lines.

Storch<sup>1</sup> in 1750, in the opening paragraph of the chapter on blemishes which children bring with them into the world, says that suggillation (*caput succedaneum*) arises when the child lingers long in the birth. He then blames the midwives for examining too much and too hard during the birth, for this sometimes produces swellings like hen's eggs full of blood.

His practical familiarity with the disease is evident when he says further on, that if the blood does not disperse, but remains as a soft node and a tumor, one should not await suppuration but must open the node with a lancet, letting out the black blood, and dressing the wound with a camphorated emplastrum. One must be especially careful in treating those swellings which occur over sutures and fontanelles, as they may communicate with the brain and cause death if opened. He further cites the case of a high-born child in 1732, in which the tumor was situated laterally on the parietal bone, which he opened and thus cured.

If he had a fairly-clear conception of the clinical features of the disease, his knowledge of the pathology was erroneous, showing the danger of theorizing, for in his chapter on "*hydrocephalus externus*," which it will be remembered was in his day a general term for all fluid accumulations without the cranium, he commends Bonetus for rejecting this as a disease, "because one well knows from dissections how closely the pericranium adheres to the cranium—indeed it can only be removed by scraping. If fluid were to effect this, it would occasion great pain, which is never observed in *hydrocephalus externus*; it would also rather rupture the pericranium than separate it from the pericranium. This refutation of the ancients is therefore quite reasonable."<sup>2</sup>

<sup>1</sup> Johann Storch's *Theor. and Prak. Abhand. von Kinderkrankheiten*. Eisenach, p. 111, and p. 119, 1750.

<sup>2</sup> Das Pericranium würde, wenn es von innerlich quellenden wasser abgetrieben würde, eher zerreißen, als sich vom Cranio abheben. Welche Widerlegung der Alter denn auch gar vernünftig ist." T. I. p. 394.



While these earlier notices of cephalæmatoma, among the French and German writers, have been more or less fragmentary and indistinct, the first notice which I have been able to find in the English language is a quaint, singularly clear, life-like description, by an author known only by the initials R. B.

His contribution appears in the well-known family magazine of the last century—*The Gentleman's Magazine and Historical Chronicle*, published in London in 1754, by Sylvanus Urban, to which R. B. writes—"Some time since I was desired to visit a child a fortnight old, that had a swelling as large as a small hen's egg, on the superior part of the right parietal bone, without any discoloration of the teguments. The tumor felt soft, but had not a very perceptible fluctuation. It was observed by the women soon after birth, and when it had once excited their notice, its increase was easily discovered." He took it for an ecchymosis and was considering whether "an incision might not prove the most judicious as well as expeditious attempt to cure. Under such considerations I made a more careful re-examination of the tumor, when I very distinctly felt the bone terminating in an edge quite around its basis. As this circumstance had escaped my first notice, it gave rise to other reflections, which very soon outweighed my former opinion, and induced me to believe that nature was deficient in her ossifications, and the tumor formed by the brain, forced out of place by the almost constant crying and struggling of the child, and the want of due resistance in that part of the cranium. When I had carefully reflected on the last-mentioned circumstances, I thought myself very happy in the discovery, because, had I pursued my first-formed opinion of the cure, I tremble to think of the consequences—by a moderately-tight bandage, and embrocations with aromatic brandy only, the tumor became gradually less, so that within a fortnight there was not the least remains to be discovered."

It is interesting, now a hundred and thirty-six years later,

in the light of better knowledge, to follow the writer's train of thought, and observe how his first conclusion, that he had to deal with a blood tumor, was correct, and under this correct assumption he was about to pursue an incorrect plan of treatment, that of opening the tumor; but when he discovered the little bony ring surrounding the tumor, almost a pathognomonic sign of cephalæmatoma, misled by the impression conveyed, he jumped to the conclusion that the case was a hernia cerebri, under which erroneous assumption he then pursued a correct plan of treatment—palliative applications. He was thankful for escaping from an error into which he had never fallen, while he was actually delivered from a mistake he had no idea he was committing.

Henkel (*Siebente Samml. seiner Med. und Chirurg. Anmerk.*, Berl. 1760, p. 49) describes a case of tumor of the right parietal bone, and contends that Le Dran's case was not a hernia cerebri, but a form of external hydrocephalus, or spurious aneurism, or an ecchymosis.

Van Swieten<sup>1</sup> in 1765, in his commentary on Boerhaave's *Aphorisms*, gives a clear definition of the significance in his day of the term hydrocephalus:

"Hence hydrocephalus, a collection between the external teguments themselves, between these and the cranium, between the cranium and the cerebral membranes; among the membranes themselves, their duplicatures, between these and the brain; among the folds of the brain in the cerebral cavities." He quotes Aëtius and Stalpart van der Wiel, but gives us an account of cephalæmatoma ("Nonnunquam tamen etiam fœculentam et Sanguineam") which is much confused with caput succedaneum.

Levret<sup>2</sup> does not confuse other tumors of the head with hernia cerebri, for he writes, paragraph 1248: "I have observed that occipital tumors are of bad augury, and most of

<sup>1</sup> Gerard L. B. van Swieten, *Commentaria in Hermanni Boerhaave Aphorismos*, T. iv. Sec. 1217, p. 118.

<sup>2</sup> *L'Art der Accouchemens*, Third edition, Paris, 1766, p. 258.



the children die soon of convulsions, which rarely happens in the case of tumors of other parts of the head." He continues, § 1249, "There is a kind of tumor which instead of diminishing, increases in volume, and tends to suppuration; if the skin has retained its natural condition, it is fluid blood which escapes."

Levret's treatment was to make a crucial incision, emptying all blood and reuniting the edges of the incision by suture.

In 1787, Baudelocque<sup>1</sup> wrote: "it is a rare thing to see a child after a long, tedious labor which has not a tumor on its head. At other times it is a tumor filled with blood, which cannot be opened too soon, as it is located on the cranial bones, which could become diseased by too long contact with the blood."

Osiander wrote of the disease in 1787, but I will defer a consideration of his work, as I wish later to refer to a discussion relative to priority, into which he entered in 1821.

In the year 1792, Dr. Detharding, of Rostock, wrote thus to the editor of *Starck's Archiv*:<sup>2</sup> "About four weeks ago I delivered a woman of her child by forceps. The child had a rupture of the brain; on the middle of one of the parietal bones is a tumor of the size of a hen's egg. It is soft, but has not the sensation of fluctuation. It is covered by the natural healthy skin and round about the border of the tumor, one can distinctly feel the margin of the defect in the bone. Upon pressing somewhat harder on it, the child at first draws itself back in anxiety, and by continuing the pressure, begins to cry. I have now a hollow leaden plate on it with compresses moistened with strong brandy, but thus far see little improvement. I am thinking of lessening the size of the concavity of the plate, little by little, in order to close in the tumor gradually, and see if I cannot, in that way, get a good result. Your opinion would be welcome to me."

<sup>1</sup> J. L. Baudelocque, *Principes sur l'art des Accouchemens par demandes et réponses*, p. 543. Paris, 1787.

<sup>2</sup> *Starck's Archiv*, Jena, 1792, p. 765.

With the close of the last century, in the year 1799, appeared in *Löder's Journal*<sup>1</sup> an essay by Dr. Michaelis, of Harburg, "On a Peculiar Form of Blood-tumor." This paper has, with some propriety, been referred to ever since as laying the foundation of our knowledge of this subject. We shall shortly see that Michaelis had a pretty clear knowledge of the clinical features of the disease, although in gross error as to its etiology and pathology. We shall also consider the grave charge of dishonesty laid by Prof. Oslander at Michaelis's door, and thus modify our opinion more or less as to the character of Michaelis's work, whether original or compilatory.

We will, I think, after the above quotations from the older writers, not feel inclined to discredit those earnest laborers whose work lay in the gray dawn of scientific medicine, when views of the specific differences between diseases were still clouded in the mists of the mysterious. They showed us, their followers, the legitimate road to success by accumulated, patient observation, the way we have walked ever since. In thus paying tribute to their work, we can say, with enthusiasm, "they have labored, we have entered into their labors."

Michaelis says: "I wish to speak principally of a very peculiar sort of blood-tumor on the head of the newborn child, which is always connected with the corruption of the bone, and sometimes at a later date, through defect of the bone, occasions death. This tumor must, under no circumstances, be confused with that which comes from a slow, protracted birth, and the consequent rupture of the bloodvessels, although children are sometimes born with it, or acquire it a few hours after birth. That it is no ordinary tumor of the head, or protrusion of the brain, or hydrocephalus, the following symptoms clearly show:

"*First.* We find it often after an easy birth.

"*Second.* It does not always appear on those parts of the

<sup>1</sup> Löder's Journal, Jena, 1799, vol. ii. pt. iv. p. 657.



head which presented in labor, although this may be the case, as it is usually found on the parietal bones :

“*Third.* It arises sometimes—and this is probably the usual way—the day following the birth, while on the other hand, the caput succedaneum is born with the child.

“*Fourth.* This tumor is more elevated and circumscribed than the caput succedaneum, and yields a distinct fluctuation.

“*Fifth.* The scalp overlying the tumor is unchanged in color, and can easily be pushed about without moving the tumor, an evidence of its deep situation.

“*Sixth.* The tumor neither disappears on pressure nor is it made smaller. Pressure also has no effect in making the child soporific, as in the case of hydrocephalus and brain-tumor.

“*Seventh.* It is distinguished from a tumor arising from a chance bloodvessel or from a lymphatic tumor, by the change in the bone, which is distinctly to be felt. The outer table of the bone is wanting in all of these tumors at this place, exposing the diploë; from the beginning one can feel the sharp border of the bone around the depression. This symptom distinguishes this tumor from every other kind, and is quite peculiar to it. Upon opening the tumor thick, black blood is found lying directly on the rough bone, which is not only robbed of its periosteum but of the outer smooth table as well. If one seeks to dissipate the tumor it is usually waste time and trouble, for the deficit in the bone visibly increases owing to the pressure and irritation of the blood, which excite the absorbent vessels to greater activity, by which means a perforation of the bone can arise.”

After speaking of his experience in Italy with Paletta, and with Dr. Scheidebauer, in Vienna, through whom he gained a familiarity with the disease, he says : “Since then I have not seen such a case in a newborn child until now. In this child, which had passed through an easy birth, showing no caput succedaneum on the second day, a considerable tumor, as large as half a pigeon’s egg, was visible at the lower ante-

rior angle of the right parietal bone, but far enough removed from the border of the bone to recognize distinctly bony substance between the tumor and the suture. I recognized the nature of the tumor at once, particularly by means of the characteristic bony border. The color of the skin was unaltered.

“I did not conceal the danger from the parents, and promised to open the tumor if attempts to disperse did not succeed. It was treated for fourteen days in vain with poultices, sal-ammoniac, saltpeter and vinegar, and with a warm brew of mountain arnica blossoms cooked in vinegar. I did not like to delay longer, especially as the parents were so anxious to get rid of the disagreeable lump. I therefore opened the tumor on the 23d of February, with a bistoury by a medium-sized incision. Thick, black blood ran out. The bleeding was very moderate, although the child was quite pale. I used, with the best result in checking the bleeding, charpey dipped in alcohol. I found the bones as usual—rough and bared, and the outer table wanting. The margin round the circumference of the tumor could be distinctly felt.” After a period of free suppuration, he states that: “On the 6th of March I found all healed up, and could only recognize the depression in the bone by its sharp border through the skin.” After speaking of vascular tumors of this part, Michaelis states in a postscript that “The above-mentioned child died on the 24th of March, 1799, of a general erysipelas extending from the legs over the whole body.” He says: “I did not lose the opportunity to examine the condition of the bone in the position of the tumor. As I incised the covering of the bone I discovered it was robbed of its outer plate and was rough and red, but united with the pericranium. This was the condition of the bone as far as the tumor had extended, with the exception that in a few places the outer table had begun to regenerate. Around the margin was a border, a line in elevation, round and smooth. I regret that I could not keep this piece of bone so that, by transmitting the same to the editor



of this journal, I might by actual inspection convince many of this peculiar sort of bony defect."

The views of Michaelis bore fruit at once. The disease was henceforth readily recognized and no longer mistaken for hernia cerebri, but his false views as to the pathology were also adopted by many, while they very soon provoked on the part of acute observers a vigorous opposition.

Thus Jahn<sup>1</sup> refers to an observation by Naegele, stating that "Herr Michaelis makes the observation that bloody tumors of this kind are always associated with destruction of the bone, and in this way are almost always fatal."

And Hencke,<sup>2</sup> in 1809, is also dominated by this idea when he writes, in his work on diseases of children, "The cure is often tedious and the malady for the most part fatal."

Burchard, in 1837, wrote: "It cannot be altogether denied that G. P. Michaelis was the first writer who referred this cranial disease to the affections of the newborn."

In 1812 Naegele<sup>3</sup> wrote, in a somewhat elaborate foot-note, "This disease seems to be but little known,<sup>4</sup> and as far as I remember, the first publication came from Dr. Michaelis."

Then follows a careful abstract from Michaelis's work, after which he adds, for his own part, "That the statement of Michaelis that the external surface of the bone is always rough and robbed of its outer smooth table, as well as his opinion that the bloody tumor is a consequence of the defect in the bone, cannot be supported by my experience. Never upon opening these tumors have I found the bone rough, injured, or corroded, but always smooth. That Michaelis has always found the contrary, I can well understand, when he waited as long in all his cases as in the last, where he delayed operation for fourteen days. I am rather of the opinion that

<sup>1</sup> Jahn, Neues Syst. der Kinderkrankheiten, Rudolstadt, 1807.

<sup>2</sup> Handb. zur Erkennt, und Heilung der Kinderkrankheiten, Frankf. a. M., p. 119, 1809.

<sup>3</sup> Erfahrungen Mannheim, p. 245, 1812.

<sup>4</sup> "Diese Krankheit scheint noch wieng bekannt zu seyn."

the injury of the bone arises from the prolonged detention of the blood between the pericranium and the skull, whereby its nourishment and growth in this place are interfered with. I do not, however, deny that this is possible, that the bone is diseased and rough in case the tumor should have existed some time before birth, but this must be extremely rare, for in none of the cases observed by me or detailed to me by others, which I have been able to collect with care for ten years, was this so. A year ago, I received from a young physician a description of a case apparently of this sort. He was called to a child five weeks old, which had brought into the world with it two such bloody tumors, one on the middle of each parietal bone. The surgeon who had opened the tumors, the third day after the birth, stated that he had found the bones carious. This statement, however, is not very reliable, for he had found himself, on account of this opening, in an embarrassed position. The child was in a very weakened condition through loss of matter and blood. This condition increased up to the sixteenth week, when the plate of bone was thrown off. Diarrhœa set in and the child died. About the middle of the left parietal bone there was found a hole about an inch and a half in circumference. On account of the extreme serious consequences, due to delay in emptying out these tumors, this evil deserves the greatest attention on the part of the physician."

Naegele further says he has seen these tumors from the size of a bean to a hen's egg on all parts of the bony scalp. When several existed they were connected by a small bridge or often separate. They always occur from two to three days after birth, and in a few cases where the tumor was observed small and flat immediately after birth, it slowly enlarged up to a certain size and then ceased to grow.

*The tumors contain black and usually coagulated blood, and after opening filled again, necessitating a reopening. After a few days the tumor is surrounded by a bony ring. The*



cases are observed after easy births, never after difficult or forceps labors.

Paletta, in 1810,<sup>1</sup> and again in 1820,<sup>2</sup> wrote a description of this disease which is of classical beauty for clearness and succinctness. He held the views as to the cause of the affection which were promulgated by Michaelis, who refers to Paletta as his instructor.

It is impossible to pass over this most important epoch in the history of cephalæmatoma without noticing more in detail statements made by Prof. Osiander in 1821.

A long series of years separate us from the workers of the last century, and it is sometimes a difficult as well as an unpleasant task to rake up the dead ashes of old strifes and jealousies, and attempt to sit in judgment upon our predecessors. In the present instance we have from Osiander a clear and succinct, and, perhaps, justly bitter statement, that Michaelis was dishonest in failing to give credit for valuable information given him at his clinic.

Osiander's words are these: "One must not confuse these tumors with the imaginary one described by the deceased Dr. G. E. Michaelis, which he pictured as very dangerous, and yet stated that he has cured them, tumors which he in reality confused with those described by me. As he returned from his travels he visited me on his way home, just as I was about to open one of these blood tumors in a newborn child. He saw the operation and was very much astonished that I so boldly opened it down to the bone, and he prophesied serious consequences, assuring me that he had had experiences of this kind in Italy, and the children always died when such a tumor was opened, because the outer bony layer was wanting down to the diploë, and that in Italy they dispersed them with warm fomentations. I was, therefore, much surprised as I read soon after an article in *Löder's Journal*: "Ueber eine eigene Art von Blutgeschwulsten, etc."

<sup>1</sup> De abscessu capitis sanguineo, Mediolani, 1810.

<sup>2</sup> Exercitationes pathologicæ, Mediolani, 1820.

We must render tribute to whom it is due, although it is almost a century since, and if we recognize in Michaelis's writing the first clear clinical picture of cephalæmatoma we should give even more credit to men like Osiander and Paletta, who preceded and taught him; we will also recognize in his writing, as we cast a glance over the host of essays which appeared within the next thirty years, but the voice of one who chanced to speak first of a host ready to cry out. The great error committed by Michaelis in his positive statement that the outer table of the parietal bone is wanting and the bone is carious, remained a source of great confusion and argument for a generation afterward, and led to an active operative interference in cases of cephalæmatoma, which would have been otherwise undisturbed.

In the year 1822, there was published at Heidelberg an excellent dissertation by C. Zeller,<sup>1</sup> a pupil of Naegele's, in which he vigorously opposed Michaelis's statement as to the decay of the bone,<sup>2</sup> tracing the error to its proper source, the Italians.<sup>3</sup>

The important part of Zeller's description has been quoted in the original in the clinical description of the disease. His paper includes a critical study of the disease in all its aspects, and concludes by citing some twenty cases. The first was on the right parietal bone of a male infant, noticed the first day after the confinement, increased very markedly until it occupied almost the whole surface of the bone, extending  $3 \times 2\frac{1}{2}$  inches, and being an inch in height. It was opened on the seventh day and the child cured. His second case is a double cephalæmatoma, one on each parietal bone, of the size of half a hen's egg. This was opened and cured in the same way.

<sup>1</sup> De cephalæmatomate, seu sanguineo cranii tumore recens natorum, p. 65. C. Zeller, Heidelberg, 1822.

<sup>2</sup> "Contra nonnullorum opinionem, non corrosum nec corruptum nec læsum, sed læve et integrum esse, tumor apertus persuadet."

<sup>3</sup> "Quo ex libro apparet, Michaelem sententiam suam huic Italorum medicorum debere."



H. Becker wrote for *Hufeland's Journal*, in 1823, an excellent account of cephalæmatoma. His interest was first aroused by the fact that one of his children had the disease. He was much worried by the positive statements of Michaelis that the bone was diseased, and rendered anxious by Naegele's statement that it was necessary to open it, and by Goelis's recommendation to use caustic. In his doubt he applied to an experienced Dr. Günther, of Duisburg. Dr. Günther told him that he had seen many such cases and to let it alone. In this case the tumor appeared on the third day on the right parietal bone near the great fontanelle, and gradually extended back to the lambdoidal suture until it was two and a half inches long, one and a half inch broad in the middle, and almost an inch high. It formed a circumscribed, slightly tense, painless, and elastic tumor, a little warmer to the touch than the rest of the head. Around this was felt the bony ring. The bone within this seemed to be absent, as the writer at first believed to be actually the case. Deeper pressure revealed the bony floor. The color of the skin was natural; there was fluctuation and no pulsation. The child was healthy. The treatment consisted at first in lotions of brandy and water and fomentations, with elder flowers and chamomile, and later a vinous infusion of aromatic spices. In sixteen days the tumor began to diminish in size, and in twenty-two days it was gone. Three years later an unevenness of the bone could still be distinguished, as it was elevated at its anterior end about a line, and posteriorly about two and a half lines.

In three cases observed the births were slow, but not instrumental. In 1826, Hoere wrote a very valuable paper on external and internal cephalæmatoma, with two diagrams.

The following is taken from Dr. Kraus in Busch's *Journal of Obstetrics* (Zwei Falle von Kopfblutgeschwulst Neugeborner mit der Sectionsgeschichte des einen Falls, *Gemeinsame Deutsch. Zeitschr. f. Geburtsh.*, Bd. vi. p. 379):

“The first case was a woman of thirty-one, who had borne eleven children. In her twelfth pregnancy the head of the child came rapidly into the pelvis, and before the midwife could get the patient to the bed the child was shot out by a strong pain, falling on the floor in the middle of the room. The umbilical cord broke in two parts. A quarter of an hour afterward a second boy was born in the bed. Both children were small. On the head of the one born on the floor no injury whatever could be detected by careful examination. First, on the eighth day after the birth did the mother notice, on the child born on the floor, a tumor on each side of the sagittal suture. The tumor on the left parietal bone was the size of a silver dollar; that on the right was smaller and more elongate. They were treated with aromatic fomentations. Five days after the discovery of the tumor that on the left side began to diminish. In three weeks there was no tumor noticeable on the left parietal bone. The bony ring which had been felt around about the margin of the tumor had almost disappeared. The ring and the tumor had also disappeared on the right side. At the anterior end of the tumor, near the coronal suture, was a remarkable depression about the size of a groschen, encircled with a somewhat sharp, bony border. Upon pressing on it with the finger a resisting floor could not be detected. There was no pulsation. When the child was nine weeks old this place was also completely ossified, slightly depressed, and not as flat as the other bones.

The writer remarks “that the bony formation was absent in one part of the parietal bone, can be the subject of no doubt.

“The second case, a woman of thirty-three years, unmarried, bore a girl baby after twenty-four hours’ hard labor. The midwife, while washing the child, at once noticed a tumor differing from those she was accustomed to seeing. Dr. Kraus, in examining it, found close to an ordinary caput succedaneum an elevated tense tumor, occupying nearly the whole of the right parietal bone. The surface of the



scalp was unchanged in color or temperature. The tumor fluctuated, and was enclosed in a bony ring, which, however, could not be distinctly felt on the upper margin of the tumor on account of the caput succedaneum. As the child could not get proper care under palliative treatment, Dr. Kraus opened the tumor on the third day by an incision a half-inch in length. Half a coffee-cup full of bright red blood streamed out and kept discharging until he was obliged to use cold water to check the hemorrhage. A small, soft, yielding spot with a thin, sharp border was felt in the middle of the tumor, and gentle pressure at this point caused uneasiness and crying. At this time a soft place was found on the left parietal bone, also surrounded with a bony ring and fluctuating. Nothing was done to this. The child died when four weeks old. A post-mortem examination was made. In opening the tumor on the left side it was found to contain a layer of broth-like fluid not thicker than the back of a knife, lying upon the roughened bone. At one point on the upper border appeared a delicate layer of bone. On the right side at the fluctuating point near the sagittal suture, there was found a small quantity of thin pus. The surface of the bone was rough and deepened, and at the depression a place about as big as a pea, where the covering of the brain was exposed. The dura mater throughout the whole skull was perfectly sound."

In discussing this paper d'Outrepoint (page 390) described nine cases, three of which occurred in a lying-in house, and were recognized immediately after birth. The other six were seen in private practice, two of them on children born with forceps, in which the tumor was also recognized immediately after birth. In two more the midwife discovered the tumor when she was bathing the child. In the remaining two the author was first called three days after birth. The midwife declared she had seen the tumor in one case immediately after birth. The second one declared that the tumor appeared on the third day. Both were easy, rapid births.

D'Outrepoint further says, with the exception of the first

case, the children had brought the disease into the world with them. He considered the disease as a result of a defect in the bone and not produced mechanically. ("Daher glaube ich dass das Uebel waehrend der Schwangerschaft entstent und nicht waehrend der Geburt.")

D'Outrepont's method of treating them was, to make an incision as long as the tumor, let the blood thoroughly empty itself, unite the lips of the wound with adhesive plaster, and cover it with charpie. The "wound healed by first intention," and the children remained well, and the skin adhered to the bone, so that on the fourth day after the operation it was no more movable. The operations were undertaken from ten to sixteen hours after birth.

In the *North American Archives of Medical and Surgical Science*, Baltimore, 1835, page 217, Dr. Geddings, Professor of Anatomy and Physiology in the University of Maryland, gives this clinical description of the disease, stating that such tumors are seldom observed except in newborn infants, yet they are now and then met with in children of a more advanced age, and in rare instances, even in adults. He also makes the remark which has not lost its force fifty-five years later, that it is remarkable that this disease should have received so small a share of attention on the part of practitioners. "With only a few exceptions it has been entirely overlooked or very imperfectly described by English, French, and American authors; and although the German physicians have investigated it with more attention, its characters still remain involved in much obscurity."

Geddings then quotes several authorities. "Chelius," says he, "speaks of a tumor occurring in the temporal region, and Velpeau observed a case spreading over the left parietal, temporal, occipital, and right parietal regions."

"Pigné has erroneously represented that they are never found in the course of the sutures. This is contradicted by one of our own cases, in which the tumor formed over the sagittal suture, and by one of Naegele's, in which it extended from one parietal bone to the other."



"Dieffenbach thought that the tumor was between the pericranium and the integuments of the scalp."

Geddings divides the treatment into two groups. First, dispersion of the tumor by promoting the absorption of its contents. Second, the evacuation of the blood by puncture or incision. He further states that the first method should be fully tried previously to resorting to the second. Even tumors of very large size may be sometimes dispersed. Of Byerle's seven cases six were cured in a few days by aromatic vinous fomentations, and it was necessary to open the tumor in but one.

In 1838, Valleix published, in Paris, in his *Clinique des Maladies des Enfants Nouveau-nés*, one of the most thorough, carefully critical papers on cephalæmatoma which has ever appeared. Valleix based his conclusions on a number of minute observations on the cadaver, as well as upon his careful research into the literature and clinical observations.

His descriptions throughout are excellent. I will here quote but a few points in which he differs from his predecessors, citing in some detail his views as to the pathology of the disease. "In spite of the assertions of several writers there exists no well-authenticated case in which cephalæmatoma has been recognized before labor. In the one case in which I have seen the disease at its start, the integument was deep red and slightly œdematous. The bony ring does not exist at the outset. In one case it did not exist and the child died before it was formed. In another case it went on developing while under observation."

In speaking of the causes Valleix says it is a mistake to say that it occurs after easy labors, it is rather the precipitate labors we should speak of.

In his studies as to the causation of cephalæmatoma Valleix observed first that in natural labors, where there was no suspicion of injury, there was almost always an ecchymosis between the bones and their external membrane, occupying the summit of the head, from three to three

and a half inches in length, by two to two and a half inches in breadth, along the upper border of the parietal bones, and that this was considerably more extensive on the right parietal than the left; that it was wanting in one case of a twin, in which it was, however, impossible to determine whether it had been born first or last. In order to gain more exact information further examinations were made on twenty-eight subjects, between the ages of from five to forty days, confirming the statement just made. An excellent colored plate shows the ecchymotic appearance of this area, dark and infiltrated with blood, easily seen by its deepened color, through its transparent pericranium. The cellular tissue just beneath the pericranium appeared sometimes to be simply of a uniform red color, without any other change. It was oftener, however, increased in thickness and tore with ease, adhering to the bone and the pericranium in the form of little rounded red granules packed together, looking like a layer of jelly. This ecchymosis exists much longer than the caput succedaneum, which disappears at the latest at the end of two or three days, while the former has been found as late as the twenty-fifth day after birth. When there existed a layer of blood Valleix always found at the end of a certain time little bony plates, which it was very easy to detach by slipping the scalpel under them, leaving the bone with its natural radiate appearance. Valleix next asked what is the cause of this ecchymosis. Its position on the summit of the head and its ovoid form do not allow us to adopt the explanation that it is produced by pressure on a resistant plane such as the sides of the pelvis, for it is only the anterior, posterior, and lateral portions of the skull which are thus pressed upon. Every consideration tends to the idea that the ecchymosis is the result of a circular pressure, whose acting power is placed at the centre of the parts traversed by the head, which cannot be other than the cervix uteri. This explains at once how that the cervix having been well dilated by the first birth the second does not present such an ecchymosis in twin births.



The reason why the ecchymosis is more extensive on the right parietal bone is, on account of the greater frequency of the head-presentation. Valleix, after these considerations, comes to the conclusion that this ecchymosis is but the first step toward a cephalæmatoma. These are the salient points. The parts most exposed to the simple ecchymosis are also the seat of the bloody tumor. The blood, infiltrated or poured out, as the case may be, can only come from the same source. The same cause acting in different degrees can produce, first, a simple red discoloration; second, a marked infiltration; and third, a destruction of tissue with the pouring out of a layer of blood. The connection between these three steps is a distinct one. In three cases examined post-mortem, the ovoid discoloration was evident on one side, due to an infiltration of blood, on the other, was a well-defined cephalæmatoma. The cephalæmatoma is, therefore, but the fourth degree of this scale.

Doepp (in *Walther and Ammon's Journal*, vol. 32, Berlin, 1843, pages 99-108) observed, in an extensive private practice in the course of twenty-six years, but 3 cases of cephalæmatoma. On the contrary, in St. Petersburg Foundling Asylum, in a period of eleven years, he had occasion to treat 262 cases. Of these, 1 was on the squamous portion of the left temporal bone, 2 on the occipital bone; all the others on the parietal bones and almost always near the upper border. Out of 100, 64 were observed on the right side, 31 on the left side, 5 double, that is, on both sides at the same time, 1 was triple, that is, on both parietals and on the occipital bone. The average was 1 case of cephalæmatoma in 190 children. This average was taken from 50,000 children in the institution. Post-mortem examination was made upon 11 children, 3 of whom died of the disease, with the following results:

(a) In none of these cases was there any trace of ecchymosis on the inner surface of the skull, nor was there any perforation of the skull.

(b) All the children had the disease when they were

brought into the institution. The tumor, however, often grew while under observation ; never, however, after the first three days, excepting those cases which were opened.

(c) In but nine instances had Doepp the opportunity to inquire into the character of the labor. They were in all cases easy and head-first. The mothers were strong, three of them were primiparæ.

(d) The integument covering the tumor was always of a natural color, and could be pushed about over the growth. Pulsation was never noticed. The tumor was always painless, even upon rough handling. The form was generally oval, the largest having the appearance of two or three joined together. The largest of all was four inches in length and three in breadth. The smallest was the size of a hazelnut.

(e) The hard border always existed, although not equally distinct in all places.

Doepp believes that Naegele's cases, where he did not find the hard border, were simply ecchymoses under the aponeurosis. When the tumor is opened and the blood pressed out, this border begins on the next day to disappear, and after four or five days no trace of it is left behind. Doepp thinks this peculiarity of the tumor contradicts all previous explanations as to its origin. In two post-mortems, he discovered that the hard border was composed of coagulated, hardened blood. The periosteum was everywhere normal and smooth. There were no dilated or ruptured bloodvessels. The bone was also perfectly smooth. Seven of the skulls which were kept, belonged to children in which the tumor had been opened at a later date, and where there had been a previous suppuration. In these the outer layer of the bone with the diploë was absorbed, and the hard border indicated actual destruction of the bone. These cases account for the statements of Michaelis and Paletta. Of his two hundred and sixty-five children, only three died in consequence of the



extension of the inflammation to the brain covering, and these from cauterization of the tumor with nitrate of silver (Goelis's method); the seven other children who died were carried off by intercurrent diseases. The false membrane described by Valleix was never seen by Doepp.

The treatment was by means of fomentations, and if at the end of the second week there seemed to be no tendency to absorption, the tumor was opened with an "oncotom," making an opening four to five lines in length.

In a few places the child fainted from the hemorrhage, necessitating the use of a hæmostatic solution in the sac.

Rokitansky wrote, in 1846, "cephalæmatoma is a disease of frequent occurrence on the skull of a newborn child, a disease on which far too much has been written. By the quantity of blood extravasated and the consequent swelling, it is to be distinguished from an extravasation in the form of a thin layer with an indistinctly defined margin, on the parietal bones, which is extremely frequent in newborn children. This last extravasation is, indeed, of considerable importance, inasmuch as it is only a lesser degree of that hemorrhage which constitutes the thrombus. Cephalæmatoma on the parietal bone generally resembles a kidney in shape, its greater margin lying along the sagittal border of the bone, its concave edge embracing the parietal prominence. Neither on the parietal nor on any other bone does it probably ever commence on the *punctum ossificationis*. Not unfrequently, however, it spreads over the *punctum* as well as the rest of the bone. Cephalæmatoma is constantly circumscribed near the margin of the affected bone, and does not pass beyond the suture. It is a circumstance of considerable importance, for it has hitherto been almost unnoticed, that in very many cases, in which there is a collection of blood on the outer surface of the skull, there is also a corresponding extravasation between its inner surface and the dura mater. The inner accumulation is, as a rule, less extensive, but there are cases in which the reverse is the fact. Of course, if the bone be laid bare

in this manner on both sides for a long time, the prognosis is unfavorable. Cephalæmatoma, originally, is nothing more than an accumulation of blood beneath the pericranium; there is no essential anomaly there, in that membrane or on the bone; most of the blood is usually coagulated and is of a blackish-red color; and a pale red fibrinous coagulum stained with the coloring matter of the blood frequently adheres to the inner surface of the pericranium and to the bone. An inflammatory process commences at the margin of the denuded part of the bone, and bony matter is deposited in the form of a velvety and finely filamentous osteophyte. Upon the exposed bone and inner surface of the pericranium a fluid next exudes, which is at first gelatinous, but gradually becomes more dense; and it may be observed that the bony margin becomes continuous with the layer of exudation that adheres to the pericranium, while at the base of the tumor it meets that which covers the bone. Should this extravasated blood be removed by absorption or evacuated by an artificial opening in the tumor, the pericranium and bone unite together in a simple manner by means of the exudation.

But if this do not occur a very remarkable appearance is presented in a very few cases—few, inasmuch as the inflammation usually becomes suppurative—the layers of exudation covering the bone and pericranium generally ossify. The ossification of both layers of the exudation is sometimes limited to particular spots, and sometimes partial ossification is met with only on that layer which lines the pericranium. This state of parts may lead to the error that the outer table is separated from the bone and adheres to the pericranium.

Far more frequently, when the swelling is not opened and its contents evacuated, the inflammation becomes suppurative, and ulceration or caries and partial necrosis ensue. Cephalæmatoma thus proves fatal, either by exhaustion, or by the extension of the inflammation to the brain. The fatal



result is occasionally brought about by purulent matter being taken into the circulation, and by consequent pyæmic metastasis.

"In recent cephalæmatoma a manifest congestion of the bones of the skull is pretty constantly observed. There is no question that the final rupture of the vessels is due to this congestion; and it is most certain, from the fact that in ordinary cases there is no other abnormal appearance to which the hemorrhage could be attributed. Moreover, the bone beneath the extravasated blood appears pale, and this results from the emptiness of its vessels.

"It is an interesting circumstance that cephalæmatoma sometimes coexists with effusion of blood between other tissues holding the same relation to each other as bone and periosteum. Thus peripheral apoplexy of a congested liver, or extravasation of blood beneath its peritoneal investment, is not an unfrequent accompaniment of cephalæmatoma."

From this full description, from Rokitansky, it will be seen that while he adopted much from his predecessors, more especially the work of Valleix, he still transmitted a number of the errors which it has remained for later writers to correct. His statement that few cases recovered, if let alone, without suppuration, was one particularly calculated to do harm, leading as it does to invariable operative interference. His statement that the bone and pericranium are covered with gelatinous exudation which ossifies, enclosing the tumor in a bony shell, is an error corrected by Virchow, next quoted.

Virchow, in 1863, has given an admirable picture of the disease, accompanied by three plates exhibiting the disease in section,\* showing the bony ring and showing the shell of ossification encasing the blood. Virchow says that the cephalæmatoma arises from the separation of the pericranium from the bones of the skull, by the escape of blood from vessels which pass in great number to the young bones, and which are thus torn in the act of birth, and the blood pours

itself out into the cavity thus formed. The separation comes from pressure of the maternal parts upon the child's head. At the margin of the tumor there is a hard eminence at the point of attachment of the pericranium to the skull. This border becomes thicker and thicker. By long continuance of the tumor this bony substance pushes further and further forward, gradually forming a shell over the blood tumor. While this process is going on, the tumor, as a rule, diminishes in size, and ossification, in the form of scales or leaf-like plates on the inner surface of the pericranium, continues to grow, until it forms an almost continuous layer of scales. This shell is made up then simply of little Wormian bones. This appearance has caused much astonishment until recent times, when development of bone is better understood. It is well known that it is the pericranium, from which new layers of bone are formed, deposited with the growth of the skull on the old bones. My researches have developed the fact that it is not an exudate or an amorphous blastema, but a proliferation of the layers of the periosteum from which the new layers of bone are projected. If now the pericranium is separated from the bones by means of blood, it none the less continues to form new layers of bony substance; only these cannot be deposited directly upon the old bones because the blood lies between. Only at the margin where the membrane is attached are the new layers deposited directly upon the old, and thus arises the ring. By the continuation of the ossification, the bony shell is formed. The peculiarity of cephalæmatoma is that the blood in these tumors remains fluid for an unusually long time, and at the most, the walls show a little fibrinous deposit. I have repeatedly had the opportunity of examining this blood after it had been from four to six weeks in the tumors, and it was fluid every time and had well-preserved blood-corpuscles. This is indeed fortunate, as by this means the later adaptation of the outer bony layer to the old bone is rendered possible. The artificial removal of the blood is usually not



necessary, and oftener harmful, as the bleeding is easily renewed. Patience usually brings about the desired result, and even if somewhat slower, the fitting of the periosteal bony layers is more complete in the hæmatoma which is not opened than in that which has been opened.

Runge says, writing in 1885, that cephalæmatoma never crosses the sutures or fontanelles ; and that the tumors are not at all or but slightly sensitive. The bony ring is formed after a few days. The general condition of the child is in no way disturbed. Any disturbance positively indicates some complication. The tumor is discovered on the second or third day after birth, grows and reaches its greatest extent from the sixth to the eighth day, and begins in the second week to diminish in size, completely disappearing in from ten to fifteen weeks. There frequently remains a hard, uneven eminence on the site of the tumor several months afterward. This course of the disease is the rule and only special circumstances lean to any other termination. Cephalæmatoma is a pretty rare disease. If with cephalæmatoma, the child exhibits brain symptoms, there is suspicion that the external tumor is complicated by an effusion between the dura mater and the bones, or an effusion of blood into the brain. In these cases the children die almost without exception, and we nearly always have to do with a trauma during the birth. Suppuration is another dangerous complication. This happens, as a rule, only from a wound or ill-directed surgical efforts. In explaining the pathology of cephalæmatoma, Runge adopts the explanation of Valleix, followed by Rokitsansky, in stating that it is but an advanced degree of the light effusion commonly found after every birth. The only difficulty is in explaining those cases in which it has been found after a breech labor, in cases in which the child has passed spontaneously. In several cases in the literature, operative measures in the pelvic presentation are expressly noted.

As for treatment, Runge expressly warns against any operative efforts in uncomplicated cases. Surgical treatment

can only be excused in an uncomplicated cephalæmatoma when the tumor is unusually large and after it has existed for several weeks showing no tendency to resorption.

#### IV. ANALYSIS.

I have thus devoted considerable space to a consideration of the natural history, as well as the history of the development of our knowledge of cephalæmatoma, adducing at length abundant evidence that the writers of the last century at least clearly recognized the existence of a peculiar disease, having specific characters, affecting the newborn infant, although for the most part in gross error in their pathological inferences.

I also exhibited under a series of quotations, as well as by the bibliography which follows, the interest aroused by this disease in the early part of the present century, when discussions as to its pathology were rife, discussions gradually evolving the clearer views which we possess to-day, a heritage of the labors of Nægele, Hoere, Valleix, Doepp, Bruns, Virchow, and others.

It now remains briefly to consider the subject from an analytical standpoint.

##### *a. Name.*

. The name of a disease if deliberately selected, is either an attempt to describe it by some characteristic feature, or it expresses the view of its pathology held at the time the name was given.

The name cephalæmatoma [*c* pronounced as *s*] simply characterizes a prominent feature of the disease, and is non-committal as to pathology. It means literally "blood tumor of the head;" it was invented and applied by Nægele, first appearing in print in the preface of his pupil Zeller's dissertation, who says: "*Si morbus, in quantum adhuc nobis est,*



peculiaris, peculiari nomine recte insignitur, me, quod reprehendi possit, fecisse non puto, usurpans id nomen, quo Naegle salvo meliore in lectionibus usus est."

Before this time, under the domination of a variety of theories, the disease had been variously called by Preuss in 1712 "*Sanguineo-varicose tumor*," and in 1731 by Le Dran "*Spurious Aneurism*," and "*Hernia Cerebri*." Plenck called it "*Ecchymoma capitis recens natorum cariosum*." Feiler used the term "*Ecchymoma capitis*." Oslander "*Ecchymosis*." The term "*Thrombus Neonatorum*" is found in Goelis, while Froriep simply says "*Blutbeule*."

"*Scheitelbeingschwulst*" is another German title, and "*Hæmatosteon*," and *ὀστεώματωμα* have been applied by Calisen and Rautenberg.

Burchard reminds us of a curious bit of history, long since forgotten, when he tells us that Oslander, senior, mistook the true nature of the disease, taking the tumors for *extraordinary fontanelles*—"Ausserordentliche Fontanellen der Scheitelknochen," which were thereafter briefly called "*Oslander's Fontanelles*."

Paletta expressed his views of the disease when he called it "*Abscessus capitis sanguineus recens natorum*."

"*Craniohæmatoncus*" and *Craniæmatoncus*" are awkward compounds from *Κρανιον*, *αἷμα*, *ὄγκος*, —skull, blood, tumor, and are rightly obsolete terms.

Hoere wishing to be more exact than *cephalæmatoma* called it "*Cranicæmatoma*," inasmuch as it does not appear indifferently on all parts of the head, but only on the cranial vault.

Busch calls it "*Pericraniæmatoma*," and Bruns also with greater exactitude, bearing in mind the cases of internal hemorrhage from which he wishes to distinguish it, applies the name "*Epicraniæmatoma*," or "*Epicranial hæmatoma*."

Valleix noted many cases of hemorrhage superficial to the pericranium or subaponeurotic, and distinguished this form by the name "*Cephalæmatome sous pericranien*."

We thus see in this brief review, that the name has been

used to teach both pathology and clinical characters, and musters before us as well a long-forgotten history, telling of the struggles of our predecessors in their attempts at analysis and classification of the affection.

*b. Sex.*

There is a marked predisposition to the formation of cephalæmatoma on the part of the male sex. Thus Burchard has noted a proportion of 377 males affected to 100 females, and Seux, while estimating the difference as far less, still notes the marked disproportion of 142 males to 100 females. This is not, as we shall see, without its etiological significance.

*c. Site. d. Number.*

Naegele has spoken of a number of tumors on one child's head, and Zeller, in his second observation, cites a case of double cephalæmatoma, one on each parietal bone, the size of a hen's egg cut in half.

Depaul (*Journal des Sages-Femmes*, August, 1877), in a clinical lecture, stated that he had seen as many as three tumors on one child.

Ruge (*Berliner klin. Wochenschrift*, No. 5, 1876) mentioned a case of a woman dying inter-partum, in whom a fully-developed child was found in breech presentation, with a cephalæmatoma on each side.

Garceau (*Boston Med. and Surg. Journ.*, July, 1872, p. 47) reports a case of cephalæmatoma over each parietal bone.

Valleix emphasizes the facts that it is oftenest found on the posterior-superior angle of the right parietal bone. In five cases he found two on the right, two on the left parietal, and one on each parietal.

Valleix further says that when the cephalæmatoma crosses a suture it is not *subpericranial* but *subaponeurotic*.

Dr. V. Bruns (1854), in one hundred cases of cephalæ-



matoma, found the tumor over sixty times on the right, over thirty times on the left parietal, two to three on the occipital bone, and one to two times on the frontal and temporal bones.

Doepf, in two hundred and sixty-two cephalæmatomas, found one case on the left temporal bone, and two on the occipital.

Mildner noted out of ninety-six cases four on both parietals; two cases were occipital, one frontal and one temporal.

Depaul remarks that cephalæmatoma rarely crosses a suture or intrenches on a parietal boss.

Dr. Firor (*Amer. Pract.*, vol. i., 1880, p. 214) cited a case in his practice in which the tumor was formed upon the occipital bone.

*e. The mother.*

The majority of all cases occur in primiparæ. Burchard notes twenty-nine primiparæ as against eight pluriparæ.

*f. Pulsation.*

There is a curious want of accord on this head. Pulsation is undoubtedly a rare sign in cephalæmatoma, and its absence has been taken as a most important diagnostic difference between this disease and hernia cerebri; but there are not wanting writers who declare they have observed its presence here also, while others deny its existence in uncomplicated cases, asserting that when present it must indicate fracture of the bone, and probable communication with an intracranial meningeal cephalæmatoma.

Burchard noted pulsation in two tumors, and confirmed his observation by many witnesses. Internal cephalæmatoma was found on death.

Hoere says as the tumor swells and becomes more tense, a pulsation felt at first disappears, and when the elasticity goes down it becomes more doughy.

Nægele also noted the presence of pulsation.

By common consent it is one of the rarest signs, and its presence must, in the present state of our knowledge, render the prognosis grave, putting the doctor on his guard against intracranial complications.

*g. Size.*

The cephalæmatoma is usually small at the start, seated above the boss of the right parietal bone. It grows visibly for several days, extending in area as well as becoming more prominent. It may thus finally cover the whole parietal bone, boss included. The loss of blood thus taken out of the circulation by this internal hemorrhage is evidently considerable and sometimes serious in its consequences.

Paletta (1820) had an idea that the tumor grew until it was opened. This, however, is never borne out by the fact, as the growth commonly ceases in from four days to a week.

*h. Fluctuation.*

This sign varies with the stage of the growth; it is, as Valleix says, usually very distinct, but sometimes obscure. The extreme tenseness of the tumor, or a little œdema of the overlying skin, as well as the unusual complication of coagulated instead of fluid contents, may all interfere with the fluctuation.

Hoere (1826) says if one opens the tumor in the period of increase the blood is bright red; later, as the elasticity begins to diminish and a doughy feeling is present, one finds black blood, often coagulated.

Dr. Tanner (*Diseases of Infancy and Childhood*, edited by Meadows, London, 1870, p. 377) is clearly wrong when he states that "it generally pits on pressure."

After the little bony plates form on the under side of the periosteum, and the blood has been almost completely absorbed,



a peculiar, parchment-crackling sensation is conveyed on palpation and the fluid is felt to shoot from under the finger.

Gayeon thus describes the process of ossification in the pericranium: "Dix jours plus tard je sentis de petites pointes osseuses qui toutes portaient de la circonférence, et convergeaient vers un centre commun, passant sous la peau et audessus de la tumeur, dont la saillie était à peine sensible. Bientôt les pointes osseuses s'étaient multipliées à l'infini, et plusieurs d'entre elles se touchaient par leurs extrémités."

*i. Color.*

Levret (1772) said the color of the skin covering the tumor was unchanged, and although this is unquestionably the rule, and, therefore, one of the most important diagnostic marks, it is not without its notable exceptions.

Naegele saw cases in which the skin was altered in color, and Valleix, a most conscientious, careful observer, saw a case where, before the tumor had swelled and become tense, the skin was lightly œdematous and of a deep red color.

*j. Sensitiveness.*

The tumor has also in a few rare instances been found sensitive to pressure.

*k. The Bony Ring.*

The small, elevated ring of bone which everywhere limits the cephalæmatoma at its outer margin is one of the most characteristic features of the disease, one which has given rise to most active discussions and often erroneous views. The first impression conveyed on feeling this ring, that it forms the limit of a perforation in the bone, is the view most widely adopted in the last century. The correction of this gross error did not at once give place to a right view

as to its nature, for Paletta and Michaelis imagined that, it there was no actual perforation, at least the outer table of the bone was wanting, and the disease was a caries of the bone. This notion also involves the idea that the ring exists from the very first appearance of the tumor. This Michaelis actually states.

When it was found that the bone was not carious, writers differed still more widely in their ideas of the nature of the ring. An important point in the investigation was then manifestly to decide just when the ring first made its appearance.

Zeller says: "We do not believe that the prominent margin is first felt after the tumor has for some time been in existence."<sup>1</sup>

Fortin observed a case in which no bony ring could be found at first; in two days, however, it was very evident.

Valleix says: "In two cases I have not found the ring. In the one the disease was at its very commencement. In the other it had not acquired its development. The first case died before it could be formed." In a post-mortem (p. 521) Valleix found that this ring was an elevated line in close union with the pericranium, and made up of little osseous granulations. He concluded that the ring was, therefore, of the same nature as the osteophytes of Lobstein, seen on periosteum elevated by purulent foci, in newborn children.

Virchow set the question at rest by referring it to the physiological property of the periosteum, first demonstrated by him, of forming bone by a proliferation of its inner layers.

When, therefore, the periosteum is separated from the bone by a layer of blood, it none the less continues to make bone. At the margin where it is attached, the new layers of bone and the old are in direct contact, and thus arises the ring, while a continuation of the ossification forms the bony shell of the tumor.

<sup>1</sup> "Non quidem in ea sumus opinione, illum marginem imprimis tum sentire posse, cum tumor diutius duraverit."



*1. Time of Appearance.*

The time at which the tumor makes its appearance is a matter of much interest, and has provoked not a little discussion. It is evidently of value in establishing the etiology of the disease—whether due to disease of the bone, a tendency to hemorrhage, or some other diathetic condition, or to a trauma during birth, such as pressure by the maternal parts, forceps injuries, or even injuries after birth. Observations have differed widely on this head, and some curious phenomena have been observed which we are hardly able to explain, such as the existence of a cephalæmatoma upon the immature foetus, as well as the presence of such a tumor upon children several years old or even on adults.

Timmermann says that cephalæmatoma is either noticed at once after birth, or after a few days, and it then, according to Valleix, takes but little time to develop fully—from a few hours to one or two days; the latter cites a case where the swelling at the first observation was very small, within a few hours it had manifestly enlarged, and on the following day it was one and a half inches in diameter, and a day later occupied the whole of the parietal bone.

Osiander first noted that they were sometimes discovered before birth.

Dr. Cleveland (1881) reported a case in which he found the woman in labor and the os dilated to the size of a silver dollar, and through it projected a firm tumor. The child was stillborn, weighing about twelve pounds. The tumor was a cephalæmatoma.

Burchard, in an analysis of 53 cases, says that cephalæmatoma was found in 2 before labor was over; in 24 cases a little after the labor; in 15 cases on the third day; in 1 case each on the fourth, fifth, sixth, seventh, tenth, and eleventh days. No statement is made as to the others.

Bouchut cites a case observed before birth, which had no bony ring at first.

Fortin also observed a case before birth, the size of a pigeon's egg, also without a bony ring, which developed in two days.

Valleix, who has made the most careful exhaustive analysis of the whole subject up to his day (1838), states, in spite of these and other recorded cases, that there is no well-authenticated instance of cephalæmatoma observed before birth.

Osserburg found a cephalæmatoma on the right parietal of a five and a half months' foetus (*Schmidt's Jahrb.*, xx.).

Albert also found cephalæmatoma several times in abortion cases (*Schmidt's Jahrb.*, 1846, xxii.).

Schmidt found two children affected *in utero*.

Semmelweiss saw one in a case of Cæsarean section (Hofmohl, *Arch. f. Kinderheilkunde*, i. H. 9).

Hueter found one on a footling which died immediately after birth.

In 1840 Trefurt quoted Pigné, who states that the tumor arises during pregnancy, and in his own observations discovered a tumor upon the head of a child still in the middle of the pelvis. It was about the size of a hen's egg, soft, fluctuating, and bag-like. He applied the forceps and delivered an asphyxiated child. The lax tumor gradually became more tense as the child recovered, and in the course of several hours it felt like an ordinary cephalæmatoma with the exception of the bony ring. The tumor was opened, and dark blood escaped.

We have thus been accustomed to consider cephalæmatoma as peculiarly a disease of the earliest post-natal period, either linking itself directly, or by a brief interval, with the birth. Well-authenticated instances are, however, recorded in which older children were affected. First of all is that of J. L. Vogel (*Chirurgische Wahrnehmungen Luebeck*, 1780, Part II., p. 45) "Von einer Starken Ergiessung des Bluts unter der Beinhaut des Hirnschaedels," who relates a case where a big boy climbed up on a bench and grasped a nine-year-old boy by the hair and, for a joke, tried to lift him up. He succeeded



in holding the boy for a few seconds, and then tried it again. The little fellow hid his pain for fear of his companions, and nothing was known until a tumor was discovered on his head eight days later. It was a cold, soft tumor, three inches high, occupying the whole left side of the head. Vogel opened it with a lancet in two places over the parietal bone, emptying it of two coffee-cupfuls of thin fluid. He thought at first it was under the *galea aponeurotica*, and that the periosteum was uninjured, but the sound showed that it was between the periosteum and the bone. On the following day he noticed a tumor on the left side of the forehead, which increased and was opened, and on the fourth day a tumor on the right side of the forehead. He says that in spite of the fact that the bone was exposed and the wound secreted pus for ten days, the periosteum grew over the bone and the wound soon healed.

Hoere observed a case appearing four weeks after birth. Dr. Mallock, of Hamilton, Canada, showed the writer a patient who had developed the disease at one year of age.

Hennig reported a case two years old.

Dr. Bierbaum reported a case in the *Journ. f. Kinderk.*, vol. xxxv., 1860, in which a cephalæmatoma affected the eight and a half year old son of a midwife, a somewhat under-developed boy, who had for eight days had a tumor, the size of a hen's egg, at the anterior lower part of the parietal bone, circumscribed, painless, immobile, elastic, and fluctuating. The skin retained its natural color. Around its margin was the prominent bony ridge. No explanation of the origin of the tumor could be given. The tumor grew, extending horizontally backward. On incising it, a quantity of black fluid blood ran out, when the bony borders could be more distinctly felt. The child recovered perfectly, no trace of the tumor being left behind. *Schmidt's Jahrb.* (vol. cc. p. 151) abstracts the following from Prof. Gosselin's paper (*Arch. Gén.*, Nov. 1882). A patient, a youth, seventeen years of age, had a soft tumor the size of a walnut, on the right parietal

bone; it fluctuated and was surrounded by a raised border. It was painless. Prof. Gosselin treated this by compression for two months, and the swelling diminished, when it was found that there was perforation of the parietal bone. The blood did not reaccumulate and the perforated place became filled with a dense tissue. Another case was reported in a boy eight years old. Prof. Gosselin thought these cases were due to a rarefying osteitis. He refers to a case by Dupont in 1858, where there was a hæmatoma which communicated with a sinus dura mater. He also referred to a case of Larrey's in 1866, of a man thirty-six years of age, with a symmetrical perforation of both parietal bones, a consequence of a rarefying osteitis.

*m. Frequency.*

It is a point of interest to every practical accoucheur to know with what average frequency he is apt to meet with this disease. Observation will show that he will be prone to consider the affection common or rare according as a larger or smaller number of obstetric cases are passing under his eye.

We will hardly under any circumstances agree with Clement Godson (1884), who says: "This disease is of very rare occurrence."

Hoere thought it occurred as often as 1 in 100 labors.

Burchard in 1837 also was not far from this estimate, for he saw on an average, 1 case in 108 labors.

Trefurt states, in 1840, that he had seen 11 cases in ten years in private practice, and 12 or 14 more in surgical clinics. He quotes the Berlin Institute under Busch's direction as recording 7 cases out of 2077 births, and Valleix as noting 4 cases in 1937 children. Bruns in 1854 quotes Doepp, who found 262 cases in 50,000 births in 11 years at the St. Petersburg Asylum, that is 1 in 190.

Mildner in Prag found 96 cases in 21,045 foundlings or 1



in 219. Seux in 1863, estimates by combining his own and Valleix's and Burchard's cases, that the proportion is 1 case of cephalæmatoma to 150 children.

Hennig in 1877 says out of a total of 53,506 newborn children 230 cases of cephalæmatoma occurred, or 0.43 per cent.

Hennig further says: "To a thousand sick children I reckon one blood-tumor."

Runge in 1887 quotes Hofmokl (1880), who found in the reports of the Viennese Foundling Asylum 371 cephalæmatoma in 59,885 cases, or 0.6 per cent.

Such are a few of the most important statistical estimates which have been made, and I do not think that any combination of the above statistics will give a result for practical purposes more exact than these varying figures. It is evident that the classes of cases considered, as well as local influences, have much to do with a frequency varying from 1 in 100 to 1 in 200 or more births.

#### *n. Pathology.*

It would take a long article to describe all the changing and peculiar views as to pathology which have been largely dwelt upon in the history of this affection. As Bruns says: "These bloody tumors are the most speaking examples of the manner in which the greatest errors and contradictions have found their way into science from inexact observations, not associated with a sufficient knowledge or anatomico-pathological observations."

Paletta represented the views of most writers of his time (early in this century) when he wrote: "Evidens est ex iis, quæ in cranio perspeximus, in hujusmodi malo exterioris tabulæ cranii partem aliquam deficere; item sanguinem, qui ex vasis deploes effunditur, sese colligere inter pericranium et tabulam interiorem [nam exterioris portio desideratur] abscessumque, de quo diximus, gignere. Hujusmodi naturæ,

nisi plurimum fallor, videtur fuisse capitis tumor, quem dranius describit, atque herniam fuisse cerebri probare nititur."

Many observers soon showed that destruction of the bone if it occurred at all, was rare, and that the rule was that the bone was sound and unchanged, and the essence of the disease lay in a simple separation of the pericranium from the cranial bone by an effusion of blood from ruptured vessels. Valleix laid stress on a thin gelatinous friable layer, which he found lining many tumors.

#### *o. Etiology.*

The cause of cephalæmatoma is still a mooted subject. The most natural supposition is that it arises from trauma during the act of birth, but the cases manifestly subjected to the most trauma are plainly, from the experience of everyone, not the ones most prone to the affection. The next most natural supposition is that there must be a predisposition, with the common trauma even of an easy birth, as the efficient cause. Another observer looks upon a disposition to hemorrhage as the acting cause. While there is probably truth in each of these views, they are still but general statements, barren until supported by carefully-noted facts.

The idea of a trauma would seem to be borne out by such a case as this. Nélaton says a Malayal boy was struck on the head with a stick, and a tumor formed as big as a chicken's egg. On opening it he found blood partly coagulated between the periosteum and the cranium. A child five years of age fell on its head raising a tumor as big as an egg on the right parietal beneath the pericranium.

Naegele stated that cephalæmatoma arose after easy labors, and never after difficult or forceps labors: while the first assertion is not true, the last is false.

Burchard found 37 cases where the labor was described as Eutokia, and 8 following Dystokia.

Miller (*System of Surgery*, vol. i. p. 592, Edinburgh, 1864),



incorrectly says, cephalæmatomata "form especially if the labors have been tedious, or the pains very violent."

Osiander (1787) says it occurs as well after natural as after aided labor, and thought it arose from rupture of an artery, a *vasculum emissarium*; arising from the pressure all around the head with a free area in the middle.

Hueter thought that a relaxed constitution lay at the bottom of it, and that it appeared mostly in flabby children without tone.

Dr. Ed. Martin says it comes after easy births.

Fere, on the other hand, went so far as to say there was always a fissure of the cranial bones.

Hennoch's idea was that cephalæmatoma owed its origin to pressure on the skull in passing through the pelvis; a deeper, severer pressure than that producing *caput succedaneum*, separating the pericranium from the bone.

Becker's idea was similar, for he says he thinks it is due to pressure of the head by the pains against a pelvic bone [Andrang des Kopfs durch die Wehen gegen einen Beckenknochen], and the bony ring is due to a bowing-in of the bone and elevation of the pericranium by extravasation.

Spiegelberg considered an interference with the circulation in threatening asphyxia the active factor, and reports cases of cephalæmatomata in asphyxiated children. He found evidence of the correctness of this interpretation in subpleural, subpericardial, and epicardial punctiform ecchymoses also found.

Schroeder, with shrewd insight, in search of an explanation, went back to the little subperiosteal ecchymosis found in almost all newborn children. A tumor of size is formed, according to his view, when an unusually large vessel is torn, or when the epicranium is but loosely attached to the bone.

Dr. F. Pauli, *per contra* (*Casper's Wochenschrift*, Berlin, 1841, No. 39, pp. 633-645), says (p. 640) that the bright-red blood which one finds soon after the formation of the tumor shows that it does not come from varicosity or the tearing of the veins.

Pajot says a pathological alteration seems to præexist in the bone, and labor acts only as a determining cause.

Valleix laid the foundation of a clearer understanding of the immediate, if not of the remote causes, when he demonstrated the loose attachment of the pericranium in the newborn, everywhere except at the bosses and the sutures, showing too that the outer table was not yet formed in the bone surrounding the boss. He also discovered, in his researches on the development of the cranium, that there was in almost all infants an ecchymosis between this membrane and the bone after labor (*v. Société Anatomique, deuxième bulletin, 3d series, Oct. 1835*). Twenty-eight subjects, from five to forty days old, formed the basis of his examination. Seventeen presented the ecchymosis; of these eleven had the largest part of the spot on the right parietal, in two the ecchymosis was equally distributed on both parietals, in two others it was most extensive on the left, and in two it was too ill defined to fix its limits. Its greatest length was three and a half inches and the greatest breadth two and two-thirds inches. The sagittal suture was free from ecchymosis.

In three of these seventeen cases the subpericranial tissue was so engorged with blood that it could be expressed on pressure; and in two the subpericranial tissue was no longer recognizable, being ruptured and replaced by a layer of liquid blood, the veritable beginning of a cephalæmatoma.

Bouchacourt (*Diction. Encyclopédique, etc., Paris, 1873, No. 14*) verifies Valleix's statement as to the frequency of this sanguineous infiltration after labor, and adopts his conclusions in stating that there are two factors in the production of cephalæmatoma—labor and the anatomy of the pericranium.

Dr. Ed. Martin took a similar view, connecting this disease with small flat exudates between the pericranium and the cranium so often found in the corpses of newborn children. It arises from ruptured vessels in consequence of displacement or pressure in the passage of the head through the pelvic



canal To support this explanation he cited a case of fracture of the bone with both external and internal cephalæmatoma.

Virchow (1863) states that the "cephalæmatoma arises by the separation of the pericranium from the cranium, by the rupture of the vessels which pass from the pericranium to the young bone in great numbers."

"The separation occurs during the act of birth itself by the pressure of the maternal parts on the child's head."

In considering the etiology we must further bear in mind the fact that cephalæmatoma has been observed in children born by the breech, by Naegele and Zeller, and repeatedly since their day.

Hoere gives a case occurring in 1824, in which a primipara gave birth to a weakly child in the first sacral position, and on the same day the midwife found the tumor on the head.

Ruge (*Ges. f. Gyn.*, Berlin, June 15, 1875) cites a case where a child was found in breech presentation, in a woman who had died in labor, with double cephalæmatoma.

Although many authorities have been inclined to deny the influence of trauma, too many cases of cephalæmatoma have followed the application of the forceps for this factor to be omitted as accidental in discussing the etiology of the affection.

Hoere saw three cases following the application of the forceps, but in only one did there seem to be any causal relation; here a feeble child was delivered by strong tractions. The next day a large blood-tumor was observed in the occipital region where the blade of the forceps had lain.

In another case in which Siebold delivered a lady with the forceps a cephalæmatoma developed on each parietal bone, each one of the size of half a hen's egg.

Merrem delivered a woman after violent tractions with the forceps, and the child had both a cephalæmatoma and a bloody tumor over the left eye, and died in two days of convulsions. The tumor over the eye contained about a half ounce of fluid blood, and communicated with a fracture in the frontal bone. On the brain there was about an ounce of blood.

Trefurt observed three cases of cephalæmatoma in his practice after forceps delivery.

My own case (*Medical News*, Sept. 6, 1890) was in a primipara, forty-one years of age (L. O. A.). The forceps were applied to assist an impacted head, which was thus delivered in an hour. The tumor appeared on the second day on the right parietal bone above the boss, within the grasp of the forceps-blade.

*p. Diagnosis.*

The diagnosis of cephalæmatoma is interesting more on account of the diseases with which it has been confounded in the past than because of any special liability at this day to confuse a disease so easily recognized and possessing such marked specific characters, with any other affection.

The earliest writers, Aëtius, Mauriceau, and Stalpart van der Wiel, in the century before the last, looked upon cephalæmatoma as a form of caput succedaneum which did not go down, and which sometimes contained blood and sometimes also suppurated.

Le Dran early in the last century unintentionally led many who followed him (Trew, Detharding, R. B., in *Gentleman's Magazine*, 1754, and others) widely astray when he based his diagnosis of *hernia cerebri* on the bony ring, concluding that the bone within was deficient.

The classification of the disease among the hydrocephali (*v.* Van Swieten and Storch) was not so great a source of confusion as it would appear to-day, for the different species of hydrocephalus were carefully defined under the two broad headings—internal and external hydrocephalus, and it was recognized that the one name covered affections generically different.

Zeller wrote: "Tumor capitis sanguinolentus ab ordinario tumore [capite succedaneo]. . . His signis distinguitur.



"Tumor succedaneus non tam distincte circumscriptus, tactu mollis est, et digitis pressus subsidet in fossulas, atque 12-48 horis praeterlapsis evanescit." "Ille reperitur in ea capitis parte, quæ, antequam caput per pelvim truditur."

"III. Naegele vola manus admota aliquam pulsationem probe sentiebat. Cæterum tumor sanguineus pressus nec evanescit nec minuitur. Pressio nec soporem, nec paralyisin, nec convulsiones, etc."

"Cephalæmatoma haud difficile a tumore distinguitur, qui teleangiectasia seu aneurysma per anastomosin vocatur. Hi tumores aut rubicundi aut cærulei, tactu in spongiæ modum molles, compressi sæpius minuuntur."

"Quibus signis cephalæmatoma a sanguinis effusionibus, capitis recens natorum contusione creatis, differat, in univsum facile dignoscitur. Contusionibus—Ecchymoses insignes nasci posse, notum est sanguis effusus nunc in tela cellulosa mera sub cute colligitur, nunc sub galea aponeurotica imo perieranium inter et calvariam accumulatur; cutis intumescit, dolet, rubens primo, deinde cærulea et livida aut nigricans conspicitur."

With recent history clearly in mind, Becker (1823) said that cephalæmatoma was to be distinguished from hernia cerebri by the fact that in the latter there is a hole in the bone through which the tumor is partly reducible by pressure, and a hernia increases when the child cries and struggles; it is more movable, does not fluctuate, and does pulsate. On increasing pressure the child exhibits marked nervous symptoms. The hernia is seen immediately after birth. The cephalæmatoma exhibits signs opposite to these, and pulsation is very rare.

Haller, in 1824, devotes three pages to columns showing the differential points between cephalæmatoma, caput succedaneum, and encephalocele congenita. He says that "a cephalæmatoma might well be concealed by a coincident caput succedaneum (never as yet noted), and it would be impossible to detect it for twenty-four hours."

Haller also lays stress on separating a cephalæmatoma from hydrocephalus externus, physocephalus, fungus duræ matris, læsiones capitis vi externâ illatæ [ecchymosis violenta capitis], tumores cystici et sarcomatosi.

Dubois says he does not fear confusion of this disease with hydrocephalus, and that fungus of the dura is not a disease of infancy.

The earliest writers of this century all very carefully and very accurately defined the differences between cephalæmatoma and caput succedaneum.

Busch says the caput is usually at the back of the head and extends over bones, sutures, and fontanelle. It forms in birth on the presenting portion of the head, and is bigger in proportion to the delay and difficulty of the birth. Caput succedaneum is not well defined, and has a softish feeling, pitting on pressure, but no fluctuation. It is also of a dark-blue color. It disappears in from twenty-two to twenty-four hours after birth.

Cephalæmatoma, on the other hand, appears on a part which was not foremost in birth, and oftener after easy than difficult labors, and begins to grow in the first days. It is circumscribed, fluctuates, is not impressible, and the color of the skin is unchanged. On strong pressure a pain is often felt, wanting in caput succedaneum. The bony border does exist in the caput.

Busch further considers the differences between cephalæmatoma and contusion of the head—ecchymosis violenta capitis.

“Blood tumor on occiput of the dead fœtus after difficult birth is bluish or blackish from decomposition.

“External hydrocephalus—a partial œdema in cachectic children.

“Varicose tumor, which disappears on pressure.

“Aneurismal tumor, which pulsates.

“Internal hydrocephalus, which has forced its way through



fontanelles and sutures, and which is thus situated over a suture or fontanelle and can be replaced, and

“Wind-tumor, or emphysema capitis, which does not fluctuate, is movable and crackles.

“Fungus of the dura mater, with a small base and without fluctuation, and special mode of origin.

“Fungus medullaris, which appears later in life and has no bony border.

“Fungus hæmatodes, elastic and soft, bluish or red in color, and not painful.

“Teleangiectasis, by the peculiar consistency and the color.

“Sebaceous cyst is movable and has no bony border.

“Abscess, by its previous history and termination.”

Writers following Busch soon dropped the extraordinary and the rare from their lists in the differential diagnosis.

Valleix, whose clear insight is repeatedly noted, refers to cases of encephalocele, cited by Velpeau, at the centre of the parietal bone, which was perforated.

He distinguishes it from a collection of blood beneath the galea aponeurotica, in that the latter is at first ill-defined, and lies on the part of the head most prominent in birth, and is apt to overlies a suture.

In collections of blood due to violence the margins are tumefied and indurated, and painful on pressure, disappearing insensibly into the surrounding tissue, and of a doughy consistence from the serosanguineous infiltration. He cites a case of Dubois in which there was caput succedaneum, subaponeurotic hæmatoma, and cephalæmatoma.

Valleix (page 508) further cites a remarkable case, important from a diagnostic standpoint, one which, as far as I know, has never yet been paralleled. He found on the dead body of a child a few days over a month old, over the boss of the left parietal bone, a soft, fluctuating, irregularly-rounded tumor, without change of color of the skin. Around this one could distinctly feel a prominent ridge, about a line in height, of but slight breadth, and firmly-resisting pressure.

This tumor contained almost an ounce of pus. It was seated in the cellular tissue between the pericranium and the aponeurosis. At the margin of the tumor the cellular sub-aponeurotic tissue formed a circular cord, swollen, red, and indurated. The disease had not been noticed until the child was twenty-three or twenty-four days old, when it already had the above characters. It was then thought to be a cephalæmatoma which had escaped attention.

Valleix suggested, with reservation, that such a tumor might be differentiated by its later appearance, its slow formation, and painfulness, as well as the fact that the ring could hardly acquire the hardness of bone.

Dr. Earle, of Chicago, in 1883, added to the list of affections to be distinguished from encephalæmatoma cranio-tabes—the soft places found on the cranial bones of rickety children.

Harmuth (1889) simply says as soon as a tumor is observed on the skull which does not cross the sutures, and as soon as a bony border can be demonstrated, the diagnosis cephalæmatoma is established and sure.

#### *g. Treatment.*

It took many decades to evolve the fact that with rare exceptions the let-alone treatment was best. I know of no harmless condition which has suffered more from incorrect views as to its pathology, than the one under consideration. We have here a curious example of the trite observation that extremes meet, for under the impression that the disease was hernia cerebri, Le Dran let the tumor alone and saw it disappear; in the same way the anonymous R. B., in the *Gentleman's Magazine and Historical Chronicle*, in 1754, the earliest English observer, at first made a correct diagnosis, considering it to be an ecchymosis, and on this correct diagnosis was about to adopt an erroneous treatment and lay the tumor open, when, upon discovering the bony border, he jumped at the



conclusion that it was not an ecchymosis at all, but a hernia cerebri, and based upon this erroneous correction of his first diagnosis, he thankfully pursued the correct plan of treatment—that of letting it alone, when it disappeared. These tumors were not, however, long left undisturbed, for meddling soon asserted her rights.

Storch advised incision, and Valentini, assuring the parents that small children are more blunt to pain than adults, opened such a tumor on the head of a miller's child.

Levret advised a crucial incision, emptying the tumor thoroughly, and then closing with suture.

Smellie tells how he advised a pupil to open a tumor, and the child bled to death.

Osiander says that "when a child is born with a tumor with a hard elevated border and fluctuating in the middle, which fails to disappear in twelve to twenty-four hours with applications of cold wine, I proceed to open it with a concave bistoury. The cut should be made an inch in length, and in the direction of the striæ of the bone, and afterward dressed with a cold vinous solution. If the blood reaccumulates it must be reopened, and even opened a third time if necessary."

Michaelis, who is responsible for the diffusion of the notion that the essence of the disease was a dangerous caries of the bone, urged the same plan of treatment.

Goelis<sup>1</sup> in 1818 endeavored in vain to stem the *furor operativus* of his day, by substituting a plan of treatment, which although apparently mild and less meddling, was by no means free from danger. He used caustic on the most promi-

<sup>1</sup> "Die Trombi der Neugeborenen, wenn zertheilende Umschlaege fruchtlos angewendet werden, weichen gewoehnlich jedesmahl dem Aetzmittel, welches den hoechsten Punkt der Geschwulst in einen oberflaechlichen, eyternen zustand versetzt, nicht aber durchaetzen darf. Wagt man hier durch Trennung der festen Theile die enthaltene, meistens aus Blut bestehende Fluessigkeit zu entleeren, so wird diese sonst nicht gefaehrliche Krankheit nicht selten toedtllich. Dasselbe kann sich ereignen, wenn aus Unvorsichtigkeit ein zu grosses, weit um sich und durchgreifendes Geschwuer durch das Aetzmittel hervor gebracht wurde. Ich sah zweij Faelle der Art, die toedtllich abliefen."

nent part of the tumor with a view of establishing a superficial area of necrosis and in this way causing its disappearance by counter-irritation and a derivative effect.

That serious consequences sometimes followed the adoption of this plan, he himself confessed, for he cites two cases in which the cauterization was too extensive, and both died.

Paletta, in 1820, also tried to avoid the knife and recommended a double puncture with a needle, letting out all blood, after which the tumor flows for two or sometimes three days, and then discharges serum and finally pus, resulting in cure in fifteen days.<sup>1</sup>

Naegele, one of the keenest observers, took a decided step in the right direction when he forbade opening the tumor before the sixth or seventh day, and after opening it was to be dressed with vinegar or wine and water, and charpie laid between the lips of the wound as a drain. Under this plan all his cases recovered quickly.<sup>2</sup>

<sup>1</sup> Apertio igitur duplicato per acum, vel per scalpellum tumore, plurimum atri et fluidi sanguinis, qui cutem distenderat, exit, quique manare pergit, sed parcius altera quoque die, interdum etiam tertia. Tum flavus humor prodit, qui nonnumquam serosus evadit, et tandem, in pus abit, ut 15 dierum spatio ex toto abscessus sit persanatus." Also: "Modus hujus mali sanandi omnium tutissimus est, si abscessus setaceo perfodiatur. Hanc viam ingressus . . . semper quam felicissimam curationem obtinui."

<sup>2</sup> Illos tumores cultro incidendi necessitatem minime ubique reperire. Nunquam hic apertionem justo tempore institutam noxios effectus sequi hujusque vidit; quin hanc curam tutam esse, et hac methodo sanationem maxime accelerari, pro certo habet.

Qua propter longe abest ab ea sententia, ut incisionem cultri ope omnino improbet, attamen in paucissimis tantum casibus necessarium esse censet. Quamquam observatio ei persuaserit majores etiam tumores apta medendi ratione discussos esse, atque ipsius opinione solventia initio morbi semper sine ullo periculo adhiberi possuit; tamen prudentissimum censet, hæmatomata extraordinarii ambitus atque altitudinis, e. gr. maximam ossis bregmatis partem occupantia, si dissolventibus remediis usurpatis intra decem dies aut duodecim plane non minuta sint, cultro incidenda esse.

Zeller: "Incidatur autem summa tumoris pars ope lanceolæ. Incisio pro magnitudine tumoris sat longa sit ita, ut sanguis collectus libere exeat. Sanguine amoto aliquid lintei carpti vulneris oræ imponatur, atque, ut spleniis et fascia levis pressio duret, curetur."

"Viginti quatuor horis proxime sequentibus ut plurimum liquor sauguino-



Other deaths followed the use of the caustic, and in April, 1825, Dr. Brosius wrote in *Hufeland's Journal* (p. 48) that he had tried Goelis's plan without success, and was finally obliged to open the tumor with a lancet.

Chelius, in 1829, advises fomentations for twelve or fourteen days, and then if the tumor remains tense, or is very large, it should be laid open, a compress laid over it, and a close-fitting cap tied on.

Dieffenbach, in 1830, expressed himself as utterly opposed to the caustic treatment and the use of the seton. He says with practical genius, attempts must first be made to disperse the tumors, especially in weakly children; the incision must be resorted to only in the most urgent cases. First use aromatic poultices and aromatic infusion of spices to disperse, or even a leech on top of the tumor. If the case does not improve in five to eight days, the tumor should be freely opened and washed out with warm water.

Gaussel (1837) saw a tumor disappear after a nasal hemorrhage.

Valleix (1838) says that the deep seat of the disease and the condition of the overlying tissues, afford slight ground for the action of medicaments; it is however, proper to use them in every case for a few days, as it does no harm. If the tumor be no larger than half a hen's egg, one can persist in this plan and await recovery. But if the cephalæmatoma is larger, and has not begun to diminish at the end of a few days, it is necessary to open it without delay, not for fear of caries as Zeller urges, but because the tissues at this time offer a better chance of being reapproximated. There is no need to fear hemorrhage, as the vessels are obliterated and covered with false membrane. Make an incision proportioned to the size

lentus effluit. Postero die, si vulnus denuo obligatur, capitis integumenta jam ossi parietali inhærentia invenimus; sanatio brevi tempore subsequitur."

"Cl. Michaelis tumorem primo quoque tempore aperiri jubit, Naegele vero id ante sextum aut septimum a nativitate diem fieri vetat, impulsus et propria experientia."

of the tumor; there is no danger in laying bare the bone, as the great vitality of the parts makes mortification impossible, and the reunion of the teguments easy. Incise as far as possible from the arterial trunks. After incising and emptying the tumor, place a little lint between the lips of the wound, and over this a pledget fastened in place.

Sir James Y. Simpson, 1848 (*Edin. Month. Journ. Med. Sci.*, April), said that he had an opportunity of seeing a considerable number of cases of cephalæmatoma, and he had never seen any treatment required except time and patience. The difficulty in their management generally consisted in keeping their friends and others from doing something or other to them (*v. Simpson's Obs. Works*, edited by Priestley & Storer).

Rokitansky (1855) had an exaggerated notion of the dangers of cephalæmatoma. He says: "Far more frequently, when the swelling is not opened and its contents evacuated, the inflammation becomes suppurative."

Virchow (1863), after a more direct and accurate account of the disease, says that it is, as a rule, unnecessary to evacuate the blood by artificial means; it is even injurious, as the bleeding is easily renewed. Patience, for the most part, leads to the desired end.

Pajot (1853), in his admirable thesis upon presentation of which he was elected Professor Agrégé, speaks in no undecided terms. He says, "Expectancy, resolvents, compression, caustics, setons, puncture, with and without injection, and incision, make up the various means which have been proposed and put into practice for the cure of cephalæmatoma."

He further says "expectancy is proper, nay, I believe it should be the rule, in all cases where the tumor is small or of moderate size. If the tumor persists, deep puncture with the lancet may be employed and the contents either emptied or allowed to discharge of themselves, and a dressing applied."

Hennig (1877) says we will only open a non-suppurating blood-tumor when, after eight or twelve days' waiting, it has steadily increased in size, and brain-pressure symptoms appear



which may be due to a coincident internal hæmatoma. Make a medium-sized incision about half the breadth of the tumor, under antiseptic precautions, and apply an antiseptic dressing under a cap. Where the contents are fluid, aspiration may be used. Gassner emptied a tumor, thirteen days old, of one hundred grammes of blood, antiseptically, and cured it in nine days.

Betschler, Ruge, and others have endeavored to settle the merits of treatment by incision and expectancy, in cases of double cephalæmatoma, by incising one tumor and letting the other alone, with the result that the tumor incised disappeared long before the other. I will close these references by a quotation from M. Runge (1885) which nearly embodies my own views:

“In spite of the fact experience has taught us a hundred-fold, that cephalæmatoma left to itself gradually disappears by absorption,” there exist a number of methods of treatment “in part coming from hungry surgeons, and in part invented by too busy doctors” (Vogel).

“I, myself, have only seen harm from opening these tumors. In several cases a threatening secondary hemorrhage came on, and it was necessary to tampon, after which suppuration naturally followed. In other cases there was no hemorrhage but there was also no adhesion, but a suppuration was established which lasted weeks and ended in death.

“I expressly warn against any surgical interference in uncomplicated cases.

“Surgical interference is only to be excused when an unusually large tumor lasts for weeks and shows no inclination to resorption. The operation is then not urgent until suppuration sets in. Puncture and aspiration are the best plan.”

Many other interesting observations on the treatment of cephalæmatoma are to be found in the *Med.-Chir.-Ther. Wörterb.*, published in Berlin, 1839, and in Anton's *Heilformeln*, 1852, and Siegert's *Med.-Ther. Woerterb.*, Berlin, 1856.

r. Deaths from Cephalæmatoma.

Smellie (1770), as already quoted, advised a practitioner to open such a tumor, and the child bled to death.

Henschel, of Breslau (1826), in earnest defence of his desire to let these cases alone, cites a case in which the tumor was opened and the child bled to death on the day of the operation, in spite of every attempt to check the hemorrhage. Henschel comments on the waiting plan as "*tuto*" and "*jucunde*," in comparison to the "*cito*" of the operation.

Goelis (p. 179) saw two cases die after the use of caustic.

Osiander says he saw a death from caries where the tumor was not opened.

Paletta cites a death in his own practice.

Valleix operated on a weakly child, dividing a branch of the temporal artery. The child lost a large amount of blood and died the next day.

Dr. C. P. Noble, of Philadelphia, related to me in conversation a case terminating in suppuration, infection of the glands of the neck, pyæmia, and death.

Bednar (1850) reports two cases of death after operation, from suppuration and caries of the bone.

Kopp (1815) saw a death from perforation of the parietal bone.

Garceau (*Boston Medical and Surgical Journal*, 1872) cited a case which died of suppuration after operation, and another case in which he did not interfere, but in which convulsions set in and death took place fifteen days after birth.

Dr. Arnold stated (*ibid.*) that he had seen a cephalæmatoma occupying the frontal bone and projecting over the face. He opened it and applied tannin to arrest a profuse hemorrhage. Death ensued within a few days.



## V. MEDICO-LEGAL.

The existence of a bump containing blood, on the head of a young child, to the lay mind, is almost *primâ facie* evidence of an injury received either by a blow or fall.

This fact, associated with the frequency of cephalæmatoma, and its liability at any time to be found upon a newborn child dying under suspicious circumstances, renders it a matter of urgent necessity to place the subject in its proper medico-legal relation.

The danger of unjust suspicion falling upon an innocent party was appreciated as soon as the clinical features of cephalæmatoma were commonly recognized by the medical profession, for Dr. K. C. von Klein published an important medico-legal work as early as 1817, on "the hitherto accepted consequences of the falling of children on the floor in rapid birth." Dr. Klein here gives an excellent description of cephalæmatoma, classing it as a specific disease. He lays especial stress on the important fact that although a direct consequence of the birth, it may make its first appearance from four to six days after. He pointedly remarks: "These very extravasations of blood can give rise to the most mournful errors, and the medical expert cannot have his attention too strongly directed to this subject."

In the case of a disease thus important to physicians and lawyers alike, it is, indeed, strange that as late as 1878 such a lax statement as the following could find a place in an authoritative work on medical jurisprudence (Francis Ogston, London, 1878, page 257): "Subpericranial effusions—resulting from the tediousness of the labor and compatible with its survival after birth, to which the term cephalæmatoma has been given."

More remarkable still is this strange confused statement in

Taylor's *Principles and Practice of Medical Jurisprudence*, London, 1865, p. 946, under the heading "A Protracted Delivery.—The death of a child may proceed in this case from injury suffered by the head during the violent contractions of the uterus, or from an interruption to the circulation in the umbilical cord before respiration is established. A child, especially if feeble and delicate, may die from exhaustion under these circumstances. This cause of death may be suspected when a sero-sanguinolent tumor (called cephalæmatoma, or caput succedaneum) is found on the head of a child, and the head itself is deformed and elongated."

The simple, uncomplicated, external cephalæmatoma on the newborn child can never be considered as *primâ facie* evidence of an injury occurring after the birth of the child; on the contrary, the presumption in every case is rather against such an origin of the disease.

In older children the case is different. Thus, Prof. Jacobi (*Med. Times*, May 8, 1875) exhibited a child five years old, who had a cephalæmatoma on the right parietal bone, following a bad fall. The swelling was large, fluctuating, and surrounded by a bony ridge.

While the above is true in cases of simple cephalæmatoma, the case just cited, and many of those previously recorded in this paper show that trauma may act as an efficient cause, producing a tumor in all respects and appearances like the true simple external cephalæmatoma. The suspicion of injury grows daily stronger after the first week following the birth.

Dr. C. H. Golding-Bird reports a case called a "traumatic meningocele" (*Guy's Hosp. Rep.*, 1889, p. 363), of a girl seven months old, which fell from the lap of the nurse to the floor. A small lump appeared at once, and in five to six days began to grow until it formed a large fluctuating tumor  $5\frac{1}{4} \times 5\frac{3}{4}$  inches over the right parietal bone, except at the outer upper angle. It pulsated markedly. The tumor swelled when the child cried. It had a hard crater-like edge. Exploration with a canula revealed blood and flakes of lymph.



The little patient suffered no inconvenience from the lump. In eighteen days the tumor subsided. No trace of a fracture could be detected.

When external cephalæmatoma is associated with an internal cephalæmatoma, the two communicating by means of a fracture in the bone, the child usually dies in convulsions; here the presumption is in favor of severe injury received, either during the birth or after it.

It must be remembered that apart from the numerous characteristic signs of cephalæmatoma already detailed, bumps arising from blows or pressure commonly exhibit a marked discoloration around the seat of injury, from the infiltration of the blood into the surrounding tissues, in addition to the signs of œdema of the surrounding skin, and tenderness, the former obscuring the outline of the affected area.

## VI. ADDITIONAL CASES.

I. During the present year (1890) Dr. Archibald Mallock, of Hamilton, Canada, saw a child, a year old, eleven hours after a fall, on whose head a tumor had developed, occupying the upper part of the right parietal bone, behind the boss. It was two and one-half inches in diameter, fluctuated and had a hard elevated border. The color of the skin was unchanged. The tumor was sensitive to pressure. The child was in poor health. In one week, with emollient applications, the tumor had disappeared. I saw the case with Dr. Mallock and could discover no trace of the tumor.

II. The following case occurred in the practice of Dr. George Erety Shoemaker, of Philadelphia, who has kindly written the report and placed it at my disposal. "A case of cephalic hæmatoma :—" The mother was a full-blooded negress, primipara, aged twenty years. Labor was normal : no instru-

ments were used. The child was small though not emaciated. It seemed from birth to be under the influence of some cerebral disturbance.

Soon after birth a hæmatoma two and a half inches in diameter was noticed on the right parietal bone, with hard, elevated, sharp-cut edges which gave the impression that an opening existed in the skull. This swelling constantly increased in size till death occurred on the third day. For the first twenty-four hours, mucus deeply tinged with blood flowed from the mouth. The umbilical cord, though carefully tied, bled on the second day, and though again tied, needed after some hours a third ligature, which finally controlled the oozing. Very deep jaundice appeared on the second day. The following conditions were present from first to last: The eyes were tightly closed; both hands, forearms, and arms were in a state of tonic spasm; the respiration was shallow and gasping; no effort was made at suckling, nor would any food be swallowed; at intervals a peculiar short cry was uttered.

The post-mortem, unfortunately not complete, showed a hæmatoma under the periosteum of the right parietal bone without communication with the brain cavity.

Death was apparently caused by a general effusion of blood beneath the dura mater. No separate clots were found.

III. Cases of cephalæmatoma observed by C. C. Frederick, M.D.:

M. S., aged twenty-five, American, primipara, was delivered January 29, 1882, of a male child, weighing eight pounds. The vertex, at first right posterior, rotated to vertex right anterior at lower straits. The labor-pains were strong and rapid. The second stage was longer than usual because of third position. No forceps were used. Exact length of second stage of labor not noted.

January 30th, tumor appeared upon left side of head near the sagittal and lambdoid sutures, accompanied by convulsions. Tumor, fluctuating, advanced over nearly the entire



parietal bone. Convulsions continued, coma and death February 2d.

Autopsy, February 3d. *Blood-tumor between the left parietal bone and the pericranium, communicating with an effusion of blood found between the right parietal and dura mater.* The point of communication seemed to be near the posterior bregma in the sagittal suture. A slit torn through the longitudinal sinus a few lines in length. The clot beneath the pericranium was smaller than that upon the dura, and both were black.

Mrs. R. S. A., aged twenty-four, American, primipara, was delivered February 22, 1890, male child, vertex left anterior. First stage tedious, membranes having ruptured early in labor. Duration of first stage fifteen hours.

Feeble pain in second stage rendered forceps necessary, while the head was at the middle straits. Delivery under chloroform. Noticed ptosis of right upper eyelid of the child twelve hours after labor. The forceps-blade made a slight cut over the right frontal protuberance.

February 23d, tumor soft, fluctuating, appeared over right parietal protuberance, size of a silver dollar.

February 24th, tumor had increased in size, extending forward to the cut upon the frontal bone, from which black venous blood oozed. Made pressure over this cut by iodoform collodion and absorbent cotton to prevent further hemorrhage. By February 25th the tumor had advanced over the entire head from nape of neck down to the ear on each side, and into the orbits, having crossed all the median sutures of the skull.

February 26th, the child died. No autopsy. I am convinced it was a blood-tumor, because of the blood having escaped from the cut upon the forehead for several hours. I think the child died from the amount of blood lost through this wound and beneath its scalp. It had no convulsions or other signs of intra-cranial pressure.

Mrs. A. H., aged twenty-three, American, primipara, de-

livered Febuary 22, 1890. Male child, vertex left anterior, perfectly normal labor, no forceps used.

February 23d, nurse called my attention to a fluctuating tumor upon the child's right parietal bone, over the tuberosity, the size of a silver dollar or larger. The edge of the tumor was sharply defined as by a bony ring. In six weeks the tumor was entirely absorbed, leaving a slight periosteal thickening over the site.

## VII. CONCLUSIONS.

While it has not been my object to bring forward any new facts relative to cephalæmatoma, I have thought it equally important, and I hope in this that I have been successful, to present a picture of the disease, in many interesting particulars widely differing from that found in any of the various text-books of to-day. We have thus seen upon the most reliable testimony that there is not a single sign looked upon as characteristic, which is invariably present, or which may not in some rare instances assume another appearance, suggestive of a different affection.

Thus, the common time of the appearance and formation of the cephalæmatomatous tumor, which is after birth, does not always hold good in indicating the diagnosis of a cephalæmatoma as distinguished from a congenital tumor like hernia cerebri, for the exceptions quoted showed that cephalæmatoma may even exist before birth, and be felt in the maternal passages.

The absence of color does not always distinguish it from a suggillation or a bruise, for it in some instances is of a livid or red color.

Fluctuation does not always show that the contents are fluid, for they are rarely coagulated.

The bony ring itself is sometimes wanting for a time, and



in Valleix's case there was even a hard ring surrounding an accumulation of pus above the pericranium; in one case of true cephalæmatoma the child died before the ring formed. The crucial test, that the tumor never crosses a suture, has also failed in a few instances, still open to doubt as to the exact seat of the effusion.

It is therefore at once clear from all these statements that no one sign makes a diagnosis more than probable—it is the conjunction of signs, taken with the history of the appearance and development, which go to make the diagnosis.

An evident discrepancy exists between those cases which were evidently due to trauma (as in the forceps cases cited), and the large number of cases following easy labor; we need at this point more exact observations to determine what is the proportion of forceps cases, and stating exact site of the tumor on its first appearance, whether within the grasp of the blade of the forceps or not.

Careful post-mortem should be made in all cases when possible, but most of all in those which cross a suture, and in cases which have presented brain symptoms to determine in the first instance whether the fluid really lies between the pericranium and the bone, or between the pericranium and the galea aponeurotica.

When we bear in mind the frequency with which external and internal cephalæmatomata are associated, together with fracture of the bone, it is evident that we are not warranted in unhesitatingly offering so favorable a prognosis as has been the custom, until by a more careful inquiry we have excluded the probability of a coincident accumulation within the cranium.

Much is still obscure in the etiology of this affection, and we are not yet warranted in reaching a positive conclusion; many clinical facts point to the resistance offered by the cervix uteri as the prime cause—a conclusion which I think at first sight seems improbable. Such facts as the following all point in this direction—most cases occur in primiparæ, boys are oftenest affected, and it is found by preference on the right

parietal bone, on the part of the head most subject to pressure from the undilated cervix, before flexion has occurred, there is also the great preponderance of the left occipito-anterior position over all others, explaining the position of the tumor. All these points unite to heighten the probability of this view of Valleix's.

We must remember, too, that this area, thus exposed to pressure early in the labor, is exactly that in which we habitually find the ecchymotic spots after natural labor. Cases of twins, in which one is affected, ought to be carefully noted and reported, as it would be an important additional evidence, if it were found that the first twin born was always the one affected, because of the passage of the second through the already dilated cervix, which therefore offers no resistance. That other far different causes may operate is manifest from the cases of forceps labor quoted, from the numerous cases occurring in older children, or even in adults cited above.

### VIII. BIBLIOGRAPHY.

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